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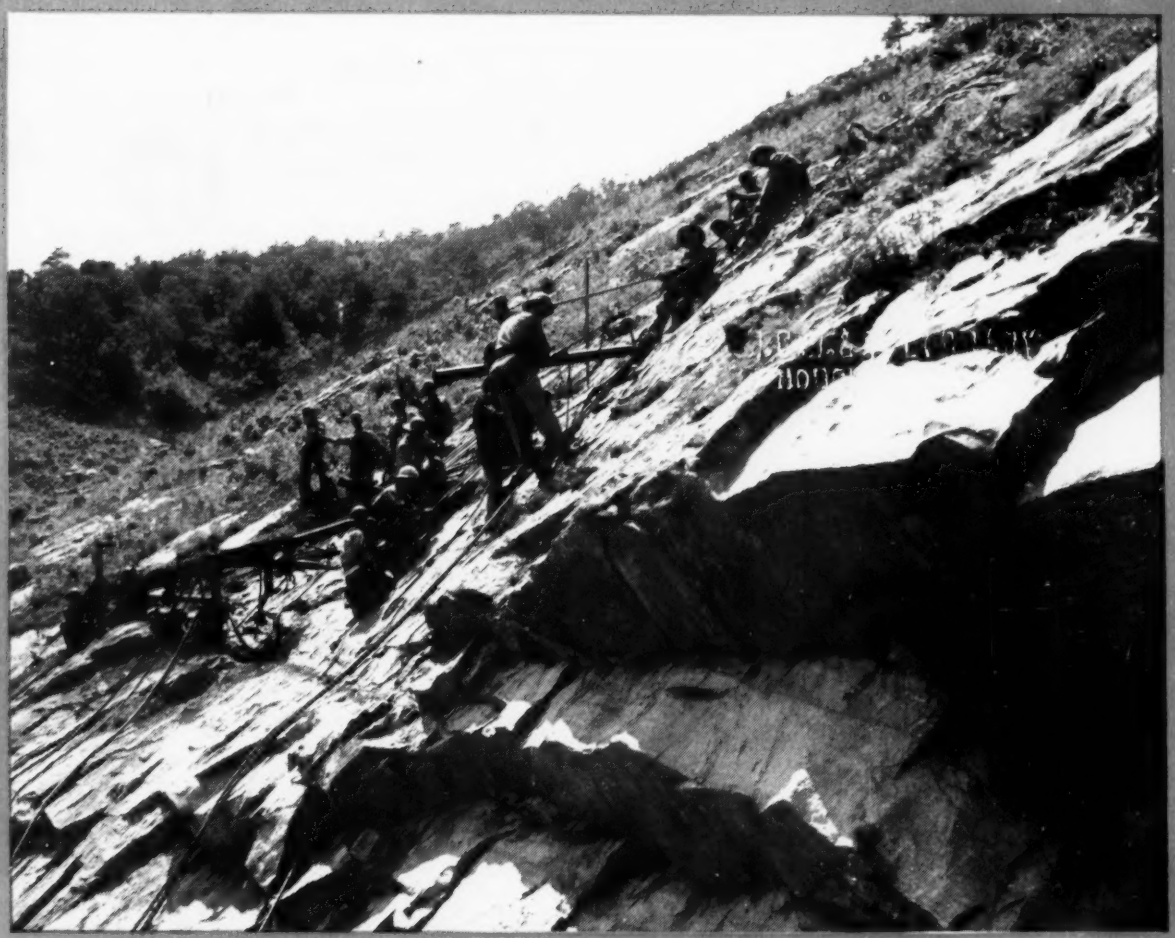
JANUARY 1948

ROCK PRODUCTS

THE INDUSTRY'S RECOGNIZED AUTHORITY

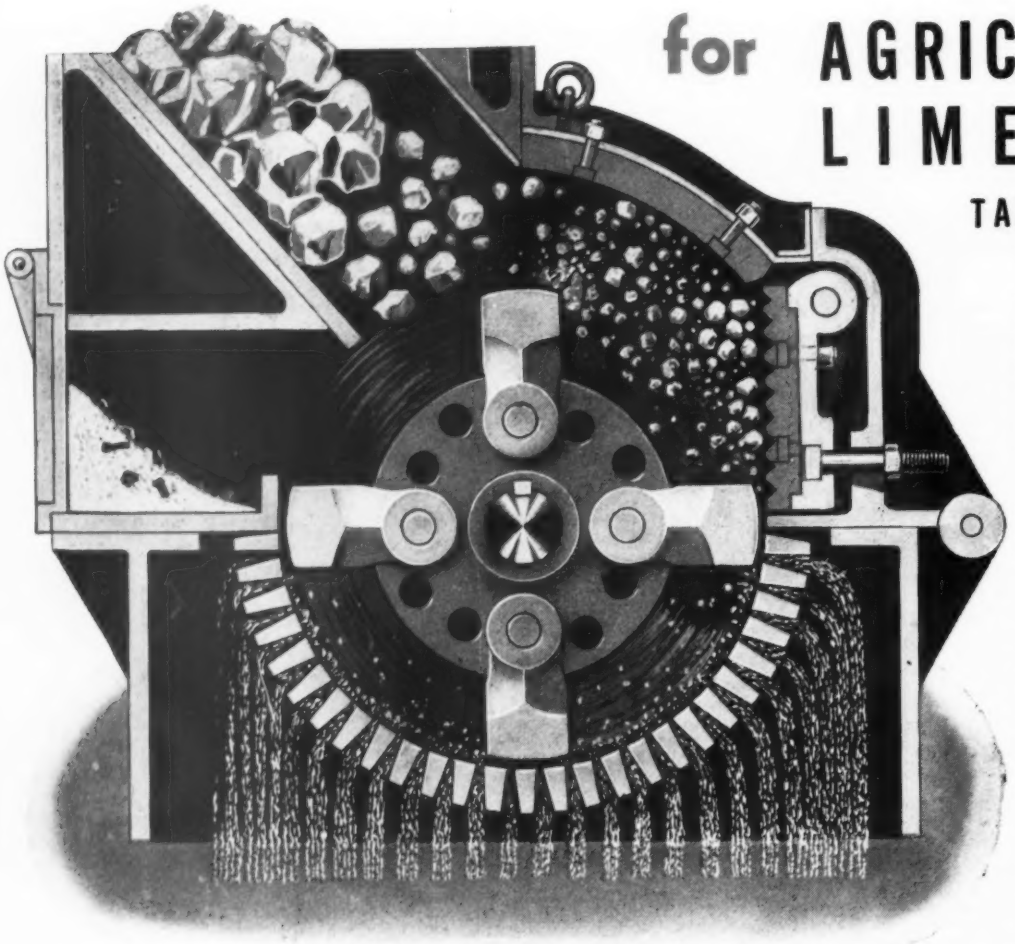


Preparing blast involving 520,000 lbs. dynamite for stone aggregate, Wautauga Dam

ANNUAL OUTLOOK ISSUE

THE WILLIAMS "NF"

for AGRICULTURAL LIMESTONE



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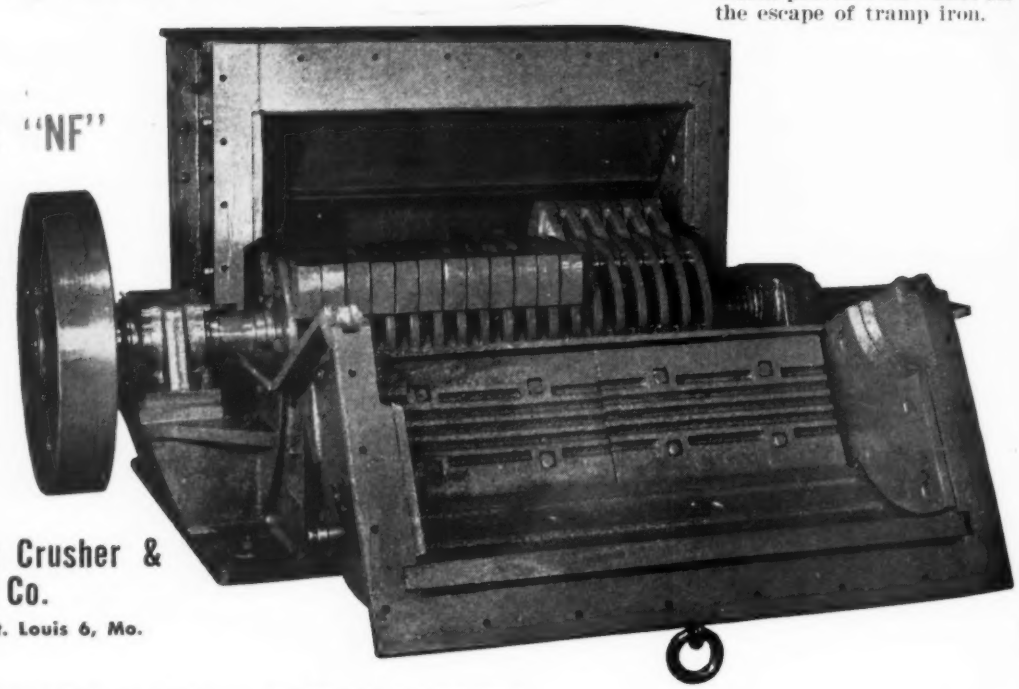
The "NF" is built in a large range of sizes with capacities from 3 to 75 tons per hour, affording a size mill for any job.

Sectional view of Williams "NF" type hammer mill, with heavy liners and grinding plate for limestone and other hard material. Particular attention is directed to the grinding plate adjustment which assures uniform close contact of hammers and grinding plate at all times. Also note the metal trap which provides an outlet for the escape of tramp iron.

FEATURES OF THE "NF"

- Adjustable Grinding Plate
- Hammers Adjustable to Overcome Wear
- Larger Capacities
- Lifetime Construction
- 2" Top Liners, 1" Side Liners
- Easy to Work On—Hinged Cover



The Williams Patent Crusher & Pulverizer Co.

800 St. Louis Ave. — St. Louis 6, Mo.

Open view of the Williams "NF" mill showing heavy duty hammers, grinding plates, side liners and cover liners. Also shows easy accessibility to mill for repairs, etc.

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Williams

PATENT CRUSHERS GRINDERS SHREDDERS

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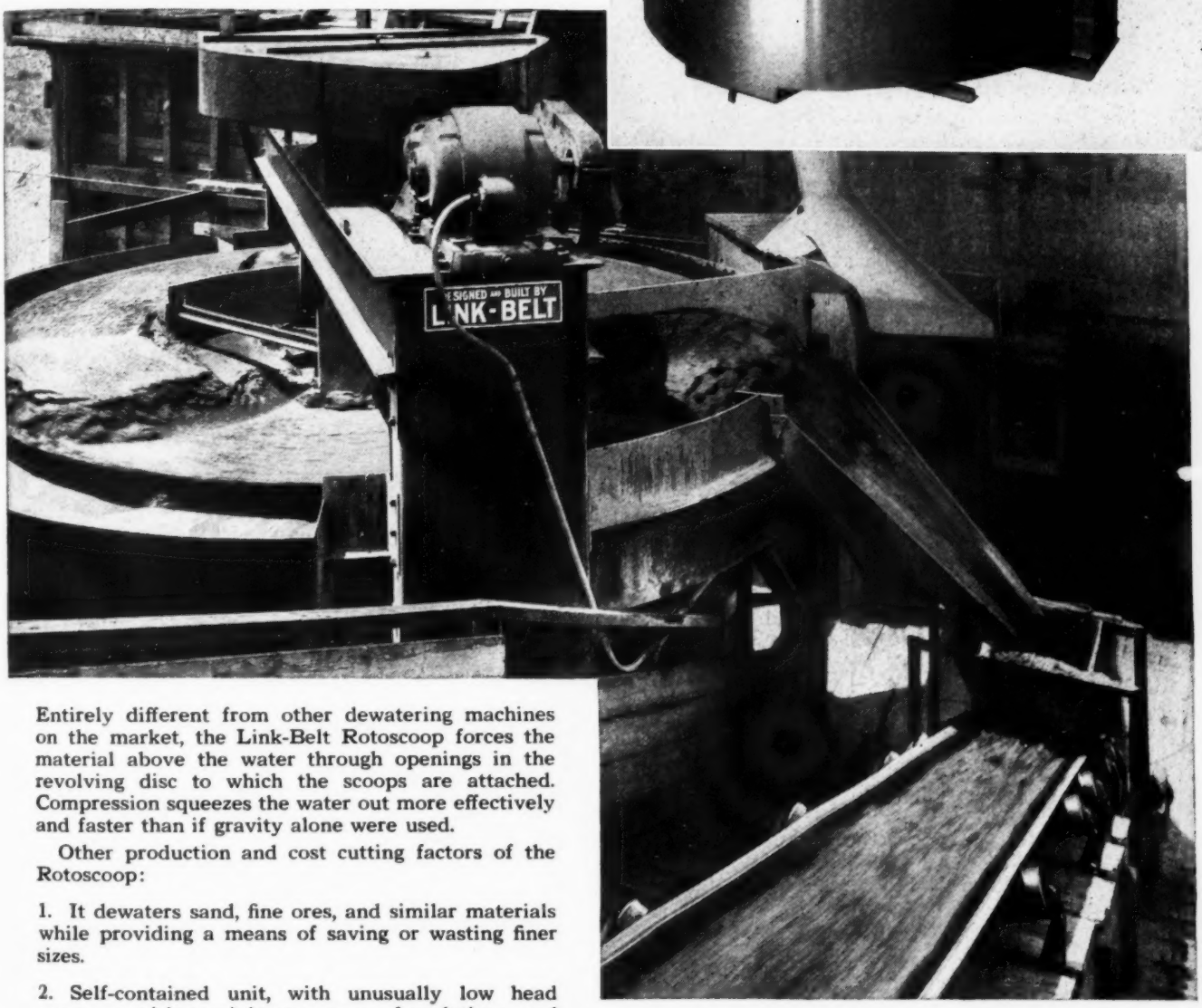
LINK-BELT *Rotoscoop* ▸



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2. Self-contained unit, with unusually low head room, requiring minimum space, foundations and supporting structure.

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4. The unit has large handling capacity and high efficiency.

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ROCK PRODUCTS

JANUARY, 1948 THE INDUSTRY'S RECOGNIZED AUTHORITY VOL. 51, No. 1

Bror Nordberg, *Editor*
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"WE HEAR..."

January, 1948

A good example of how high labor costs may be offset by mechanization is the advance that has been made in earth-moving in connection with highway construction. In the early days of hand labor and animal power, it cost more than 40 cents a cubic yard for common excavation. With the application of increasingly more economical power and development of improved designs and higher capacities for equipment, the cost had been lowered to 21 cents by 1940.

* * * * * * * * * * *

Investments in construction amounted to over $793 million in October, 1947, in the 37 states east of the Rocky mountains, according to Dodge reports. This represented a gain of 22 per cent over the preceding month and 38 per cent improvement over the activity for the same month a year ago.

* * * * * * * * * * *

Effective December 5, 1947, General Electric Co., largest electrical manufacturing firm, abandoned its "firm" price policy on heavy equipment as a protection against possible future cost increases. After that date, buyers of motors, switchgear, generators, turbines and locomotives, etc., will pay prices prevailing at time of delivery. Any price increases under this policy will be limited to 20 per cent. G. E. and some other large industrial firms had inaugurated a "firm" price basis a year ago in an effort to stabilize industrial prices but dropped the practice rather than the alternative of making price increases now in anticipation of cost increases.

* * * * * * * * * * *

According to a recent study by Small Homes Guide, Inc., the public is becoming more and more reconciled to high prices for homes. In July of 1947, prospective purchasers had shown they were willing to pay an average price of $9269 for new homes. The figure jumped to $10,450 in September and a month later to $11,239. A year and a half ago, the average was only $7000.

* * * * * * * * * * *

Nearly half of the veterans financing the purchase of homes with the aid of G.I. loans are buying newly-built houses at an average selling price of $8200 each.

* * * * * * * * * * *

Economists of the Producers' Council have forecast that expenditures for maintenance and repair of existing buildings will total some 6 billion in 1948, about the same as in 1947. Prior to the war, the largest amount spent for repairs and maintenance was $3,600,000,000 in 1929. Total volume of all building in 1948 is expected to reach $20 billion.

* * * * * * * * * * *

The number of strikes (175) in October, 1947, set a new low for the year, according to the Labor Department. During that month, 60,000 workers left their jobs because of labor disputes resulting in the loss of 1,850,000 man-days of work. Federal mediators settled 83 strikes in October and settled another 405 disputes before strikes were called.

* * * * * * * * * * *

Wages paid to labor by contractors accounted for close to one-third of the total cost of building federal-aid highways completed during the second quarter of 1947, says the American Road Builders' Association.

* * * * * * * * * * *

WE HEAR

Contrary to popular expectations, the Taft-Hartley Law will have the effect of making only one strike out of twenty subject to legal correction. The law will not affect the right to strike for the two main causes that inspire labor to walk out, which are the right to strike for higher wages, shorter hours and better employment conditions and, secondly, for recognition when no other union has earlier been certified as the bargaining agent for the union.

* * * * * * * * * * *

A bill has been proposed to Congress by Rep. Paul Cummingham of Iowa that would make the 1½ cent federal gasoline tax permanent with the purpose of using proceeds to finance federal aid.

* * * * * * * * * * *

Continued high volume of private home construction kept new building at higher than ordinary November levels. Total for the month was slightly in excess of $1¼ billion. Total new construction for eleven months in 1947, close to $12 billion, represented a gain of 29 per cent over the same period in 1946.

* * * * * * * * * * *

Bricklayers are drawing $50 pay for Saturday work in Cambridge, Mass. The rate is double time of $5 an hour for ten hours on a project being built for Westinghouse.

* * * * * * * * * * *

According to a recent Labor Board finding, an employer cannot be sure that the N.L.R.B. will set aside the results of a collective-bargaining election in his plant because the successful union made false and unfair statements in its campaign for acceptance. The Board refused to withdraw its certification of one union after the employer charged it with making false pre-election statements, and the N.L.R.B. was upheld by an appeals court after finding part of the employer's charges to be true.

* * * * * * * * * * *

An employer cannot by law be required to upgrade a reinstated veteran on the basis of time spent in military service if he (the employer) has an established practice of not crediting workers with time spent on leaves or furloughs.

* * * * * * * * * * *

Two orders issued by the National Labor Relations Board recently, requiring employers to bargain with non-complying unions, are proof that an employer can be required to bargain with a union in his plant even when its officers have delayed in filing non-communist affidavits under the Taft-Hartley Act. In the cases cited, the officers of the unions had agreed to sign affidavits within 30 days.

* * * * * * * * * * *

Number of workers in state governments increased 18 per cent, to 859,000, between April, 1946, and April, 1947.

* * * * * * * * * * *

Construction costs have not reached their peak says the Construction Industry Advisory Council in predicting that the volume of construction work in 1948 will be only slightly greater than in 1947. Continuing labor and materials shortages are the principal factors blamed for forcing a continued upward trend in prices.

* * * * * * * * * * *

Farmers will continue to be live prospects for business, having reaped a bumper crop of dollars in 1947. Income in 1947 was nearly 20 per cent higher than in 1946 which returned $25.3 billion. Before the war, farmers' income was at the $8 billion level annually.

* * * * * * * * * * *

Steel mills entered the winter with iron and steel scrap inventories at little more than half the "safe" averages with stocks in December estimated at five or six weeks' supply on the basis of production requirements then.

THE EDITORS

★ ★ Editor's Page

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6667

Results of An Unwarranted Strike

THE SETTING is a peaceful little community in the South where workers lived in tiny, modest houses clustering around a single plant in the rock products industry, from which all gained their livelihood. It was a backwoodish sort of place far remote from any metropolitan center, and so located that the workers were almost out of communication with the outside. Theirs was the simple life.

Then came the war and soon thereafter unions made their appearance felt in the wayside community. The plant grew in importance to union operatives when, in 1947, a large capacity operation was put under construction to replace the one that had supported the settlement for years.

We had occasion a few months back to be at this nearly-completed plant the very day that the labor contract expired and the workers went out on strike. The circumstances and sequence of events leading up to the shutdown were made known to us, and we came to the obvious conclusion that there was no justification for closure of the plant. It was simply a case where uninformed workers foolishly had surrendered their prerogative and permitted union agents to mishandle their affairs. Loss of business to the company will be substantial during the closedown but the stoppage of income to the individual worker unfortunately will involve hardship.

Wage Demands

The point of issue was one of wages. At the time when negotiations for a new contract began, common labor was receiving 94¢ an hour, and already had been granted wage increases during 1947 to more than compensate for rises in the cost of living. The scale was very close to those in plants operated by the same company where much higher cost of living standards prevail.

Negotiations were conducted right up until the final day of the contract, when management and union representatives were closeted from morning until late evening. Union representatives had insisted all along on a 15¢ per hour increase for common labor and an additional 15¢ for all workers classed as "operators." It turned out that the majority of all workers suddenly belonged in this operator classification, according to the union's delineation of jobs.

The increases requested plus a host of other demands, among them paid vacations, hospital insurance, pay for six unworked holidays and heavy overtime rates for off-hour work added up to a 50¢ per hour increase across the board.

Management could not justify even approaching the wages demanded in view of the wage scales that prevail at its other operations but offered a 7¢ compromise that was promptly rejected. The tempo of the negotiations speeded up throughout the final day, interrupted only by frequent recesses for private huddles in which union representatives and worker leaders would talk things over before returning for another round with management.

"The men want it" was the only reply that the union officials could give to the question on what grounds the wage increases demanded were justified in the face of evidence that increases had already been granted to compensate for cost of living rises.

Very obviously, the union agents had come into the plant and, from the beginning, were accepted on the strength of lavish promises of great gains to be accomplished through their efforts in behalf of the workers. They sold the men a bill of goods and had to back up their promises.

No Compromises Allowed

In late afternoon when it was apparent that no agreement would be reached, management offered another compromise and suggested that the union representatives consider an extension of the deadline. That "they could not grant" without first consulting the men out in the plant, which they were privileged to do. But, the workers had been so thoroughly sold by their union in building them up for a substantial hike in pay that the union could not reason with them when acquiescence meant any compromise.

An extension of bargaining time, even for a day, was refused and the plant went down promptly at midnight. There was no violence. There were no picket lines formed.

Everything was peaceful and quiet again the following day. The men had no place to go and stood around idly gazing at the plant that was crushing and screening stone the day before. Some half dozen construction crews walked off the job in sympathy, their work uncompleted.

The workers optimistically thought the strike might end in a week but its duration will be much longer, in part due to the uncompleted construction upon which full production depends. There will be hardship that could have been avoided if the workers had not placed too much trust in outsiders. Christmas wasn't a bountiful one in our little community.

Bror Nordberg

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Rocky's NOTES

Nathan C. Rockwood

Progress(?) in Cement and Concrete Research

In a recent conversation among a few men who have devoted the greater part of their lives to research on cement and concrete, there were humorous, but not too facetious, comments to the effect that now, after 30 or 40 years of intensive research and experience, we are just about where we started. They meant that insofar as being able to make an entirely satisfactory concrete, we are still a long way from reaching the goal. These were scientific men in their sixties, an age when we can be philosophical.

During nearly 40 years we have seen faulty concrete accounted for by "dirty aggregates"; too much mixing water; too fine sand; deleterious ingredients in the aggregates; not enough fines in the fine aggregates; cement with too much magnesia; too much "free" lime; too coarsely ground; weathered clinker; too high heat of hydration; too high a percentage of "alkalies"; not enough air entrainment; not enough tricalcium silicate; "reactive" coarse aggregates; poor construction methods; etc. Our list is not complete, but it is typical.

In each case a great deal of research was concentrated on the particular diagnosis of the hour. We washed "dirty" sand until it seldom contained anything finer than 10- or 20-mesh. Elaborate formulas and measuring equipment were developed to get satisfactory water-cement ratios; machines and processing were invented to get rid of deleterious particles, as specifications based on each new diagnosis grew tighter and tighter. Old methods of manufacture of cement were left behind; free lime was "fixed" by harder burning and clinker air-quenching; both raw materials and clinker were finer ground; alumina was reduced and tricalcium silicate increased; air-entraining agents were added; alkalies reduced.

Might Return to First Principles

As a student of engineering history, as well as by necessity a reader of current literature on the subject, we have taken an interest in the work of the early researchers on hydraulic cements. They had one great advantage. They started with little knowledge of the subject. Hence, they were interested in all phases of *all* kinds of hydraulic cements. Since lime is the most essential ingredient of all hydraulic cements, their research was based on a study of the chemistry of lime.

We hazard the suggestion that the same approach would be helpful today. The development of portland cement was possible because the early experimenters had observed the effect of argillaceous ingredients in limestones. Hydraulic lime was the first manufactured hydraulic cement. In some ways it still appears to be the best. Natural cements followed. The original difference between hydraulic lime and natural cement was merely a difference in the proportions of lime and argillaceous materials. Because natural cement rocks contained a higher proportion of argillaceous materials, it was found necessary to pulverize the kiln product before it could be hydrated. Both products were calcined at much lower temperatures than required for making present-day portland cement clinker.

We know that a good hydraulic cement can be manufactured without clinkering the raw materials. We know, because it has been recorded since the days of the Roman Empire, that good hydraulic cement may be made of an intimate mixture of lime and a good puzzolana. We know that these two ingredients will unite with water to form some permanent hydrated calcium and aluminum silicates whose strength and stability apparently increase with age.

Many of our early American portland cements evidently made satisfactory concrete. The cement must have been too high in magnesia; probably had plenty of "free" lime; undoubtedly contained excessive amounts of "alkalies"; the concrete was made very likely with "reactive" coarse aggregates; were sloppy mixes with unclean fine aggregate; if there was any air entrainment it was accidental. By every modern conception all these concrete structures should have disintegrated years ago; but the fact is that some of this 40- or 50-year old concrete is in better condition than much that has been placed in the last 25 years. Some of the Roman concrete is still good after 2000 years.

One might compare the growth of research in the cement and concrete industries to the growth of a tree. It starts from roots in fundamental chemistry and physics. As the number of new research techniques increases, the researchers and experimenters may get farther and farther away from the roots and the trunk of fundamentals—and the abandoned branches.

As a crude example of what we mean, let us consider the current interest in reactive coarse aggregates. Three experts of the U. S. Bureau of Reclamation have just published a report on "Chemical Test for Reactivity of Aggregates with Cement Alkalies; Chemical Processes in Cement-Aggregate Reaction." After years of experimenting they have come through with a test in which minus 50-mesh material from the aggregate is partly dissolved in a solution of sodium hydroxide (NaOH). The conclusion is that the amount of silica dissolved is not a satisfactory criterion; the loss of alkalinity of the solution (reduction in pH) is not satisfactory; but by using the two together, they believe the test can be made to show up *some* aggregates that give trouble. However, there are unexplained exceptions.

To simplify the theory so it can be understood by anyone with an elemental knowledge of chemistry, if there is free sodium hydroxide in hydrating cement (we know there is calcium hydroxide or free lime), the following reactions would take place:

$$2\,NaOH + H_2CO_3 \rightleftarrows Na_2CO_3 + 2\,H_2O$$

$$NaCO_3 + Ca(OH)_2 \rightleftarrows CaCO_3 + 2\,NaOH$$

This is a well-known process for making "soda lime." The H_2CO_3 is of course CO_2 (carbon dioxide) dissolved in water. These reactions are reversible at ordinary atmospheric temperatures, depending on several factors including both temperature and degree of dilution of the solution. The sodium hydroxide (NaOH) is a deliquescent and an absorbent of CO_2; it takes up both from rain and soil water; the reaction with lime precipitates calcium carbonate, which is denser than the calcium hydroxide [$Ca(OH)_2$] and less soluble; hence pores or cavities are created in the concrete. The sodium carbonate is also a deliquescent and with the water it takes up, reacts with silica to form sodium silicate gels, also deliquescents. The whole setup is unstable as long as there is available water and $Ca(OH)_2$ and all the reactions have a tendency to take up more water. The water or the liquid silicate gels accumulate in the voids or pores of the concrete; the precipitated calcium carbonate cannot pass through the gelatinous membranes formed, and the osmotic pressure of the water or liquid in the cavities is what causes the disintegration of the concrete. Such, at least, seems a simple, plausible explanation.

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Association NEWS

Cincinnati Convention Programs

CINCINNATI, OHIO, will be host once again to both the National Sand and Gravel Association and the National Ready Mixed Concrete Association at a joint convention and exhibit to be held January 19-23 at the Netherland-Plaza hotel. A record attendance is anticipated since this is the first meeting and exhibit to be held since the war.

The program will open Monday morning, January 19, with a meeting of the Board of Directors of the National Ready-Mixed Concrete Association, after which both the N.R.M.C.A. board and the National Sand and Gravel Association board will attend luncheon together. The National Sand and Gravel Association board will hold its meeting in the afternoon.

At 8:00 a.m. Tuesday, a breakfast meeting for members of Manufacturers' Division, National Sand and Gravel Association will be held. Opening session of the Association will begin at 9:30 a.m. and will consist of an address by President RICHARD N. COOLIDGE; reports by STANTON WALKER, director of engineering; and VINCENT P. AHEARN, executive secretary; a report from the committee on cost accounting system for the sand and gravel industry led by O'NEAL M. JOHNSON, committee consultant; and presentation of ROCK PRODUCTS sand and gravel safety trophies to McGrady-Rogers Co., Pittsburgh, Penn., and American Aggregates Corporation, Greenville, Ohio.

Following a luncheon of members of the Ohio Sand and Gravel Association, there will be an afternoon session. H. W. PROTZELLER, consulting engineer, Railway Equipment Division, Nordberg Manufacturing Co., will talk on "Railroad Ballast" after which there will be a symposium on purchaser and producer problems and the following speakers will be heard: R. R. LITEHISER, chief engineer, Bureau of Tests, Ohio State Highway Department, on "The Basis for Purchaser Requirements"; C. E. PROUDLEY, chief materials and test engineer, North Carolina State Highway and Public Works Commission, on "Specifying Aggregates on a Concrete Strength Basis"; J. F. BARBEE, assistant engineer of tests, Ohio State Highway Department, on "Special Characteristics for Concrete Aggregates"; JOHN GOSHORN, assistant engineer of tests, Ohio State Highway Department, on "Special Considerations for Bituminous Aggregates"; and Stanton Walker on "Problems of Producing Sand and Gravel." "The Story of River Sand and Gravel," a motion picture furnished by the Keystone Sand Division of Dravo Corporation, will be shown. J. R. THOENEN will be the presiding officer.

Ready Mix Session

NATIONAL READY MIXED CONCRETE ASSOCIATION will hold its opening session Wednesday morning, beginning with President FRANK P. SPRATLEN, JR.'s address, after which Mr. Ahearn and Mr. Walker will deliver their reports. Mr. Ahearn will talk on "Cement Supply in 1948," a topic based on data developed through letters sent to the presidents of all cement companies.

Both associations will attend lunch together on Wednesday, the highlight of which will be a talk on "Our Dynamic Way of Life" by ROBERT S. WILSON, vice-president Goodyear Tire and Rubber Co. A. R. SHIELY will be presiding officer.

The luncheon will be followed by a joint afternoon session featuring the following speakers: THOMAS S. HOLDEN, president, F. W. Dodge Corporation, on "Construction Activity in the Year Ahead"; HAL H. HALE, executive secretary, American Association of State Highway Officials, on "The Highway Program Ahead"; and A. ALLEN BATES, vice-president, Portland Cement Association, on "Researches in Portland Cement Concrete." Mr. Hale will be introduced by MURRAY D. SHAFFER, director, Ohio Department of Highways. PAUL C. GRAHAM will preside. The annual reception of the Manufacturers' Division will be held from 5:30 to 7:30 p.m.

At the joint session on Thursday morning, ROBERT ASH, Tax Counsel for both associations, will discuss "Depletion and Depreciation Practices in the Sand and Gravel and Ready Mixed Concrete Industries"; JAMES D. MARSHALL, assistant managing director, The Associated General Contractors of America, Inc., will speak on "What the Taft-Hartley Act Means to the Construction Industry"; and CHARLES A. HORSKY, counsel for the two associations, will talk on "New Developments in the Federal Labor Policy." HARRIS N. SNYDER will preside.

National Sand and Gravel Association will hold its concluding session Thursday afternoon after a luncheon of the Ohio Ready Mixed Concrete Association. It will consist of three discussions, "Railroad Car Supply in 1948," by CALEB R. MAGEE, vice-chairman, Car Service Division, Association of American Railroads; "Actions Taken by State Commissions on Intrastate Rates Following Increases in Interstate Rates" by Vincent P. Ahearn; and "Effects of Characteristics of Aggregates on Properties of Concrete" by Stanton Walker; and the annual election of officers. THOMAS E. POPPLEWELL will preside.

"Writing Collective Bargaining Agreements" will be the subject of a joint "open forum" evening session, the discussion to be led by Mr. Horsky and Mr. Ahearn. Typical provisions will be considered and effects of the Taft-Hartley Act will be examined. The session has been designed in particular for the delegates who handle the writing and administration of labor agreements.

A session of the National Ready Mixed Concrete Association will be held Friday morning, with ROBERT F. PORTER as presiding officer, the program of events to be as follows: a discussion of a forthcoming publication of the Association entitled "Suggestions for Sales Agreements in the Ready Mixed Concrete Industry" by ROBERT C. COLLINS, chairman, committee on merchandising; a report of the committee on cost accounting system for the Ready Mixed Concrete industry led by O'Neal M. Johnson, committee consultant; a discussion of "Administration of Collective Bargaining Agreement for Ready Mixed Concrete Industry in Detroit Area" by NORMAN J. FREDERICKS, secretary-treasurer, Koenig Coal and Supply Co.; and a discussion by RAY V. WARREN, secretary and treasurer, Ready Mixed Concrete Association of Metropolitan Pittsburgh. HARRY F. THOMSON, chairman, safety committee, will present safety trophies to Frank J. Knight Co., Centerline, Mich., and The Grand Junction Building Materials Co., Inc., Grand Junction, Colo.

Final Ready Mix Session

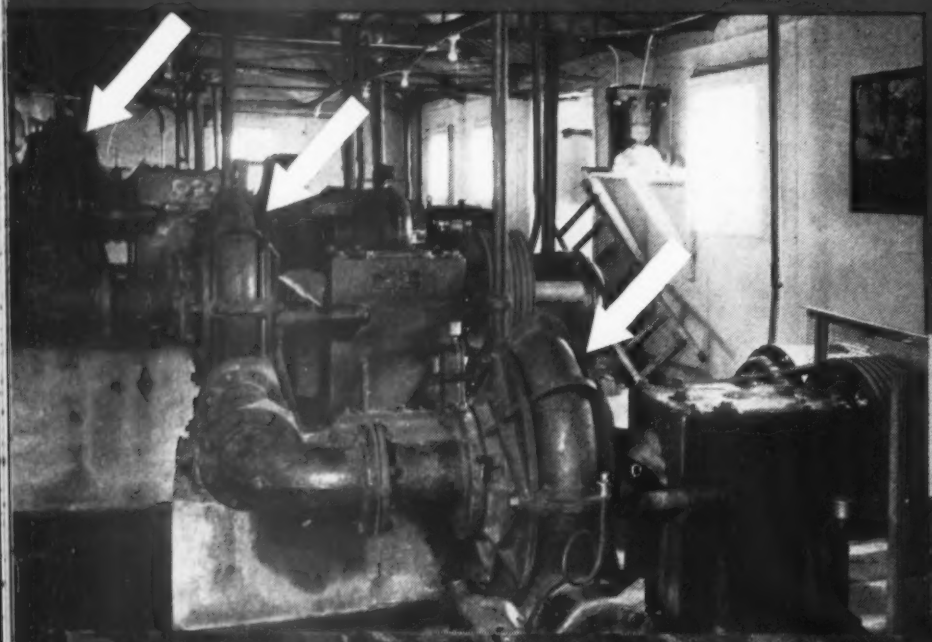
The National Ready Mixed Concrete Association will hold its closing session Friday afternoon, C. GRAY, presiding, with a report of the association's committee on truck chassis by H. F. Thomson, chairman, and, following a talk on "Correct Application of Motor Trucks to the Ready Mixed Concrete Industry," by R. Cass,

(Continued on page 83)

Engineered Hydroseal Pumping Systems

NOT JUST "PUMPS FOR SALE"

Sherwood Silica Corp. of Ottawa, Ill., knows the value of "Engineered Hydroseal Pumping Systems" by the results they have obtained since 1944, with four C-Frame and one B-Frame Hydroseal Pump. For over two years, they have pumped 900 tons of hard, sharp, silica sand per day, 300 days per year, or 270,000 tons per annum through 1890 feet of 6 inch pipe. There is a static discharge head of 114 feet, which includes two vertical lifts, the total dynamic head being 340 feet . . . In 1944 their maintenance cost for the three C-Frame Hydroseals in the pit was $0.0065 per ton of sand handled. In 1945, maintenance costs were higher, due to wartime rubber restrictions, but this year (1946) Maximix Rubber is again at pre-war quality. Maintenance costs on the B-Frame Hydroseal, which elevates sand to the washer drain bins, and the other C-Frame pump, in the pit, have been negligible since the very beginning. . . . If you have an unusual or difficult materials pumping problem, call on the Hydroseal Engineer. He can do more than "sell pumps," if you need more. Catalog on request.



One Hydroseal Pump at Washer, out of picture at right

Three C-Frame Hydroseal Pumps in series, pumping to washer, which is out of picture

One Hydroseal—C-Frame

HYDROSEAL, PACKLESS AND MAXIMIX DESIGNS ARE COVERED BY PATENTS AND APPLICATIONS IN THE MAJOR MINING CENTERS OF THE WORLD

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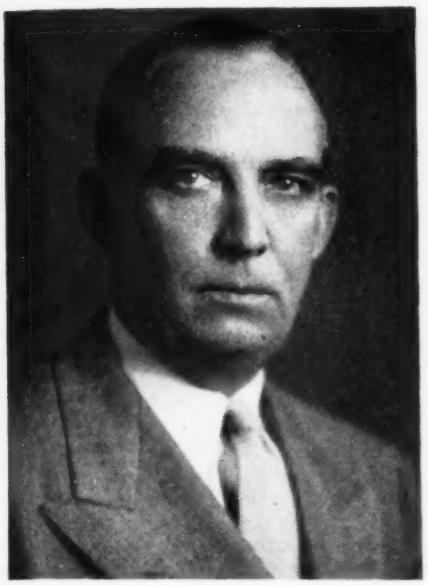
the Personal Side of the news

P.C.A. Appointment

CARL F. CLAUSEN, formerly assistant to the president of the Pacific Portland Cement Co., San Francisco, Calif., has been appointed manager of the manufacturing research section of the Portland Cement Association,



Carl F. Clausen

Chicago, Ill. He is also secretary of Subcommittee C of the General Technical Committee and will make his headquarters at Chicago. Previous to his connection with the cement company, Mr. Clausen was associated with F. L. Smidth & Co., New York, in designing and operating equipment and plants for cement and related industries. During the war he was appointed technical consultant on cement industry to the War Production Board, Washington, D. C. He was subsequently made chief of the nonmetallic building materials section with responsibility for cement, crushed stone, sand and gravel, concrete, concrete products, and gypsum, in which capacity he was administrator of limitation order 179 and government presiding officer of the Portland Cement Industry Advisory Committee.

Retires

SIMON H. INGBERG, chief of the fire resistance section of the Bureau of Reclamation, Washington, D. C., since 1920, has retired after more than 30 years of service. Mr. Ingberg directed research and introduced experimental technics that have been responsible for placing fire protection upon a scientific and mathematical basis, including fire resistance of reinforced concrete columns under load. He also was the first to give limestone aggregate its deserved rating as next to trap rock as a fire-resistant concrete aggregate—a very great advantage to producers who, prior to about 25 years ago, could not sell their aggregate for building construction.

Superintendent

HARRIS V. FEGELY has been appointed superintendent of the Monarch Cement Co., Humboldt, Kans., replacing C. P. MITCHELL who has retired, according to an announcement by Walter H. Wulf, president of the company. Mr. Fegely, who has been with the Monarch organization since 1935, was made assistant superintendent in 1941, and has been works manager in charge of manufacturing activities since August, 1946. A veteran of World War II, he served in the Signal and Transportation Corps both in the American and Pacific theaters.

Receives Scroll

RAYMOND R. BEAR, vice-president and general manager of Lehigh Portland Cement Co., Allentown, Penn., was recently presented with an illuminated scroll and a radio-victrola-television combination as a tribute to his 50 years of service with the company. The gifts were given to him at a testimonial dinner at the Lehigh Country Club which was attended by all department heads and plant superintendents from the company's coast-to-coast operations. Mr. Baer's service record began in 1897 as a draftsman when he helped design the first of the company's plants at Ormrod. In 1903 he was advanced to chief engineer, and in 1926 was made vice-president. He became a director and vice-president and general manager in 1937. Tributes were voiced by Joseph S. Young, president; John C. Bowen, executive vice-president; Raymond A. Moritz, plant manager at Fogelsville; B. L. Swett, vice-president; Roy N. Young, vice-president and operating manager; and John C. Shumberger, Jr., director of properties, who served as toastmaster.

N.S.A. President

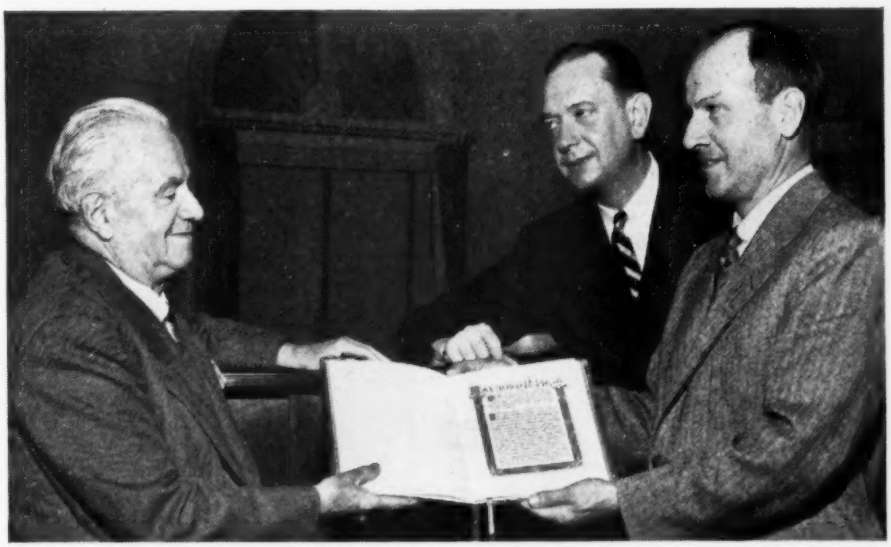
W. E. BLISS, vice-president of the Standard Slag Co., Youngstown, Ohio, has been elected president of the National Slag Association, Washington, D. C. E. L. FLAD, manager, Slag Division, Carnegie-Illinois Steel Co., Pittsburgh, Penn., was elected vice-president; E. W. BAUMAN, managing director and secretary; and W. S. SHAW, treasurer. H. J. LOVE, who for 30 years managed the affairs of the Association, has requested that he be relieved of his managerial duties, and in recognition of his services to the slag industry, the directors of the Association have appointed him as consultant.

P.C.A. Chairman

JOSEPH S. YOUNG, president, Lehigh Portland Cement Co., Allentown, Penn., has been reelected chairman of the board of the Portland Cement Association, Chicago, Ill., and H. B. ROBESON, president of the Nazareth Cement Co., Nazareth, Penn., has been elected a director for a term of three years.

Transferred

BRUCE HOSTRUP, superintendent of the Port Clinton, Ohio, plant of the United States Gypsum Co., Chicago, Ill., has been transferred to East Chicago, Ind., where he will be superintendent of the board plant.



Raymond R. Bear (left), vice-president and general manager, Lehigh Portland Cement Co., receives illuminated scroll in recognition of his 50 years' service from Joseph S. Young, president of the company. With Mr. Young is John C. Shumberger, Jr.

Joseph A. Sullivan

Publicity Manager

JOSEPH A. SULLIVAN, assistant publicity manager, Universal Atlas Cement Co., New York, N. Y., has been appointed manager of the advertising bureau, succeeding MAX A. BERNS, publicity manager, who died November 19. Mr. Sullivan has also been appointed director of public relations. Before joining Universal Atlas he was advertising manager of the Chicago Pneumatic Tool Co., and previous to that was copy chief of Sweet's Catalogue Service Division of F. W. Dodge Corp.

Sales Manager

FRED L. WAGNER, assistant sales manager of the Pittsburgh territory of the Universal Atlas Cement Co., New York, N. Y., has been appointed sales manager, succeeding RANDOLPH H. HOY, sales manager for the past 19 years, who has retired after 40 years of continuous service with the company. Mr. Wagner's service with Universal Atlas began in 1916 as salesman in the southern West Virginia territory. For more than 25 years he was sales representative in western Pennsylvania, West Virginia and Metropolitan Pittsburgh. In recent years, he has covered Pittsburgh and Allegheny counties.

Appointed President

O. G. SPICKELMEIR, vice-president of the Rock Hill Stone and Gravel Co., St. Louis, Mo., has been appointed president of the company and will assume management of the Sterling, Kans., plant. H. E. BILLMAN, his father-in-law and former president of the company, plans to give most of his time to his duties as president of the Sterling Drilling Co. SAM SALL, who has been associated with the company for nearly 20 years, has been made superintendent of the plant.

Cement Official Retires

W. G. PERROW, district manager of the Spokane, Wash., office of Lehigh Portland Cement Co., Allentown, Penn., since January, 1918, has announced his retirement under the provisions of the retirement plan of the company. He will be succeeded by PAUL G. HAHN, who has been Mr. Perrow's assistant for the last 25 years. Mr. Perrow joined the Lehigh Portland Cement Co. in 1917 as traffic manager and soon transferred to the sales department, subsequently becoming district manager. In 1941 a storage and packing plant was constructed in Spokane under his direction to facilitate the handling of the increased orders for cement. He plans to devote the major part of his activities to the development of the Spokane valley.

New Superintendent

JESS STRINGER, foreman of the Union Furnace, Penn., plant of Warner Co., Philadelphia, Penn., has been appointed superintendent in full charge of operations at the plant, succeeding H. E. Willard, who died recently. Mr. Stringer has been with the company for over 20 years, starting with the American Lime and Stone Co. in 1924.

Represents Pipe Firm

MUZAFFER UNSAL of Istanbul, Turkey, has been appointed sales representative in that country for the Universal Concrete Pipe Machinery Co., Columbus, Ohio, subsidiary of the Universal Concrete Pipe Co.

Plant Engineer

WILLIAM G. PARSLOW, formerly mine engineer at the Saltville, Va., plant of the National Gypsum Co., Buffalo, N. Y., has been appointed plant engineer at the National City, Mich., plant.

A. J. R. Curtis, safety director, P.C.A., receiving Jos. A. Holmes medal from Dan Harrington

John Curtin, Jr.

New President

JOHN CURTIN, JR., executive vice-president of the Warner Co., Philadelphia, Penn., has been elected president of the company, to succeed Charles Warner, who will continue as chairman of the board and chief executive officer. Mr. Curtin has been associated with the company for 22 years and during that time has worked in plant operations, sales work, special financial assignments, and as vice-president and general manager of the Bellefonte operations. For the past year he has assumed general administrative direction of the business under supervision of Charles Warner.

Mineral Advisory Council

LOUIS WARE, president of the International Minerals and Chemical Corp., Chicago, Ill., was one of 31 representative leaders of the major branches of the mineral industries of the United States to receive invitations from the Department of the Interior to meet with Secretary of the Interior J. A. Krug, to establish a National Minerals Advisory Council. Among others to be invited to the meeting were H. M. Albright, United States Potash Co., New York, N. Y.; B. F. Fairless, president, U. S. Steel Corp., New York, N. Y.; Donald B. Gillies, vice-president, Republic Steel Corp., Cleveland, Ohio; R. P. Heuer, vice-president, General Refractories Co., Philadelphia, Penn.; Merrill E. Shoup, Golden Cycle Corp., Colorado Springs, Colo.; and Miles Haman, manager, Crystal Fluorspar Co., Elizabethtown, Ill.

Arm Crushed

ELWOOD WALTERS, superintendent of the Jones Brosnahan rock plant east of Burlington, Kans., suffered a badly crushed right hand and arm recently while straightening the conveyor belt at the plant.

Named Vice-President

CARL R. OLSON, formerly general manager of the Permanente Cement Co., Standard Gypsum Co. of California, Permanente Steamship Corp., and Glacier Sand and Gravel Co., has been

Carl R. Olson

appointed vice-president of these four companies. Mr. Olson joined the Kaiser organization in 1933 as office manager during concrete-pouring operations on the San Francisco Bay Bridge project. He subsequently became a salesman, sales manager and then general manager of the four companies, in addition to serving as general manager of the sand and gravel division of the Henry J. Kaiser Co. Mr. Olson also assisted in the initial development of various other Kaiser activities.

In Hotel Business

HENRY CROWN, chairman of the board of directors of Material Service Corp., Chicago, Ill., has been elected vice-president and member of the executive committee of Hilton Hotels Corp.

Cement Official Retires

JOSHUA L. MINER, vice-president of the Lumnite Division of the Universal Atlas Cement Co., New York, N. Y., has retired after 25 years of service with the company. He will be succeeded by FRANK E. LOBAUGH, who has been technical service director of the division for the past three years. Mr. Miner joined the company in 1922 and two years later became identified with the Lumnite Division, then the Atlas Lumnite Cement Co. In 1937 he was elected director and vice-president of that company. He has been a member of Committee C-1 of the American Society for Testing Materials for more than 30 years and also has served on the executive committee of the Society. Mr. Lobaugh received his degree of ceramic engineer from Alfred University, Alfred, N. J., and from 1930 to 1940 was assistant professor in ceramic engineering at that university. In 1941 he joined the Lumnite Division of Universal Atlas in the technical division and sales department. He was appointed technical service director in 1944.

Heads Research Division

HERBERT K. COOK, concrete research engineer, has been named chief of the concrete research division of the Waterways Experiment Station, Vicksburg, Miss., replacing CHARLES E. WUERPEL who has gone with the Inter-American Construction Co. as the expert on concrete of the Comision Technica Norteamericana in Buenos Aires, Argentina. This commission was formed to advise the Argentine government on its 5-year plan for internal development and construction.

OBITUARIES

E. R. (RUSS) MCMILLIN, sales manager for J. K. Davison & Bro., Pittsburgh, Penn., died suddenly on November 17, according to an announcement from the Pennsylvania Sand and Gravel Producers' Association. Mr. McMillan was well known in the sand and gravel and ready-mixed concrete industries for the last 17 years.

PHILIP MOONEY, assistant general superintendent of the Medusa Portland Cement Co., Cleveland, Ohio, died November 4 after suffering a heart attack while voting. He was 46 years old and had been associated with the cement company for 20 years.

FRANK E. TOWN, superintendent of the Manitowoc Portland Cement Co., Manitowoc, Wis., died December 2 in Cleveland, Ohio, while on a business trip. He was 62 years old. Mr. Town was chairman of the Manitowoc safety commission and a past president of the Manitowoc Chamber of Commerce.

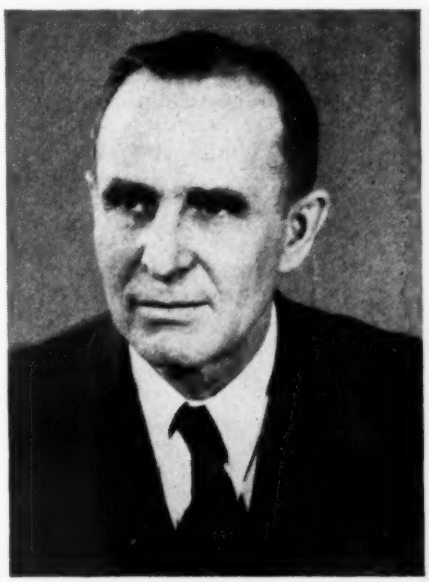
ALFRED THWEATT STROTHER, sales manager for Old Colony Crushed Stone Co., Boston, Mass., died November 15 at the age of 55.

ASA C. BUTTERWORTH, president and founder of the General Material Co., St. Louis, Mo., died on November 5. He was 67 years old. A pioneer in the development of the ready-mixed concrete industry in the middle West, Mr. Butterworth came to St. Louis in 1925 from Little Rock, Ark., and two years later organized the General Material Co., the first manufacturers of ready mixed concrete in the St. Louis area.

HOWARD F. PARKERTON, SR., manager of the Farrel-Birmingham Co., Inc., sales office at Los Angeles, Calif., died on October 27 at the age of 62. Mr. Parkerton joined the company at Ansonia, Conn., in 1901 as a machinist. Later, in 1920, he was employed at the Buffalo plant, and in 1930 was placed in charge of the newly established sales office in Los Angeles, which remained under his management until his death.

SIDNEY N. PETERS, JR., vice-president of the Lawrence Portland Cement Co., New York, N. Y., died on November 23 at his home in Summit, N. J. He was 39 years old and had been associated with the company since 1927, starting at the plant in Thomaston, Me.

MAX A. BERNS, publicity manager, Universal Atlas Cement Co., New York, N. Y., died suddenly of a heart attack, November 19, at his home in New Rochelle, N. Y. A graduate of the University of Illinois with a B.S. degree in Civil Engineering, Mr. Berns joined the Universal Atlas Cement Co. at Chicago in 1913 as publicity representative, leaving the company in 1917 to serve in France during World War I as captain of U. S. Engineers. He returned to the company's Chicago office in 1919 and a year later was made publicity manager. In 1938 Mr. Berns moved with his department to the New York office. He became a member of the Public Relations Advisory Committee of the National Association of Manufacturers and a member of the Illuminating Engineering Society. In his 27 years as publicity manager of Universal Atlas, Mr. Berns ably directed advertising and public relations activities. He was author of many product promotional pieces and collaborated in the preparation of many articles on air-entraining cement which appeared in trade journals.



Max A. Berns

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Use *Texaco Marfak* to protect vital chassis bearings in your earthmoving equipment, and solve one of your toughest lubricating problems.

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2 MORE LUBRICATION JOBS SIMPLIFIED

Dirt and moisture are tough on track rolls, also. Protect them with *Texaco Track Roll Lubricant.* It stays *in* the bearings, seals out dirt and moisture, prolongs bearing life. For heavy-duty Diesel and gasoline engines, use *Texaco Ursa Oil X**.* It is fully detergent and dispersive — makes engines last longer, deliver more power, use less fuel.

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TUNE IN . . . TEXACO STAR THEATRE presents the TONY MARTIN SHOW every Sunday night. • METROPOLITAN OPERA broadcasts every Saturday afternoon.

INDUSTRY *News*

Bids to Open on Dam And Power Plant

BIDS FOR THE construction of Hungry Horse Dam and Power Plant, near Columbia Falls, Mont., will be accepted early this year, it is expected, according to a release from the Department of the Interior, and prospective bidders have been invited to inspect the site now.

The dam will be a concrete arch structure with a maximum height of approximately 520 ft. above foundation and a crest length of approximately 2000 ft. The power plant will be a reinforced concrete structure located immediately downstream from the dam and housing four 75,000-kw. generators. A concrete-lined, radial-gate-controlled, open channel spillway will extend along the right abutment and discharge into the canyon downstream from the dam. A diversion tunnel will be driven through the right abutment under another contract.

Purchase Limestone Deposit

SOLVAY PROCESS CO., Kansas City, Mo., a subsidiary of the Allied Chemical & Dye Corp., has announced the purchase of several hundred acres of land near Illmo, Mo., for use as a limestone reserve; however, quarries may not be opened for several years. Dr. Edward L. Clark, state geologist, said the deposit contains sufficient limestone for a 50-year supply. Solvay uses limestone for the manufacture of soda ash and certain other alkalies.

Separation Plant For Fluorspar

INLAND STEEL CO., Fluorspar Division, Rosiclare, Ill., has begun operation of its new Western Knapp Mobile Mill, Heavy-Media separation plant, at the company's Keystone mine near Salem, Ky. The new operation is expected to beneficiate low-grade ore, increase reserves at the mine, and eliminate an 18-mile ore haul to Inland's mill at Rosiclare.

Lone Star Modernization

BONNER SPRINGS, Kan., plant of Lone Star Cement Co., is undergoing an extensive construction program for the purpose of attaining the utmost flexibility and coordination of operation. The program involves installation of grinding machinery, additional storage space for clinker and remodeling of finished cement storage and packing facilities. In announcing the program, M. H. Small, vice-president of Lone Star Cement Co., stated that no increase in total productive capacity is contemplated. The objective of the program is to facilitate production of the different types of cement produced at the mill.

Modern grinding methods will enable the mill to maintain a balance between grinding and kiln output, and enlarged clinker storage will make it possible to balance clinker stocks between various types of cements.

Prepared Lime and Building Supplies Co. Builds Plant

MACATEE, INC., recently completed a new plant located on five acres of a new industrial subdivision of Dallas, Texas. The new site will include warehouses, sized for future growth; a modernly engineered mortar plant; garage and repair shop; an office building with over 7000 sq. ft. of floor space and a 14-car spur track.

Founded in 1860 by W. L. Macatee, grandfather of Geo. P. Macatee, the present president, the new plant marks another step in the company's steady growth. It has always been company policy to emphasize customer service, and since 1860 the slogan "Not only to sell, but to serve well," has been kept in mind.

In the efficient new mortar plant, lime is transferred from incoming freight cars to the slake room by belt conveyor; and after processing, is pumped into large storage tanks. Seven of these storage tanks provide capacity for two months' operation, thus assuring proper ageing. Sand is stored in a protected shed of 600-cu. yd. capacity; with recovery by scoop trucks which elevate the sand to conveyors which discharge to the mortar mixing machines. The mortar mixers are elevated, providing for gravity flow of finished material to delivery trucks.

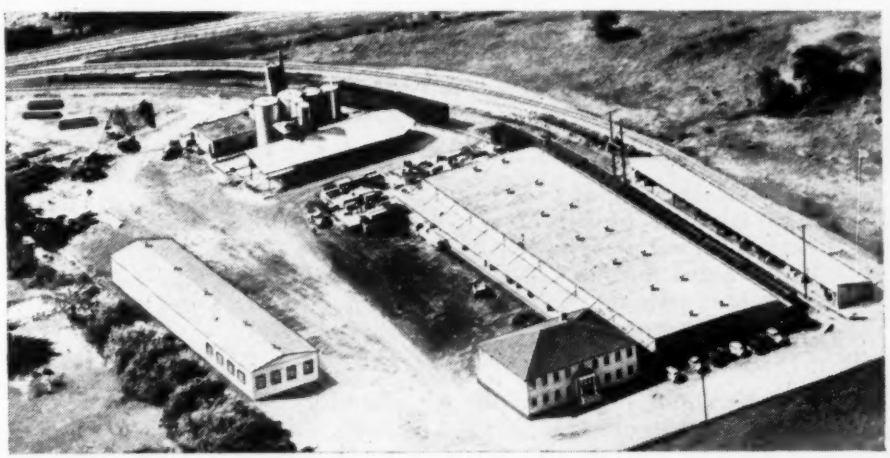
Powered fork trucks are used in the warehouse so that merchandise may be stacked several tiers high, thus conserving space. The new office includes an inter-communication system, fluorescent lighting and air conditioning. Measuring 40- x 167-ft., the garage and repair shop is completely equipped for all maintenance jobs on the company's fleet of 28 trucks, including several semi-tractor trucks. Officers of the company are Geo. P. Macatee, Jr., president; C. O. Johnson, Sr., vice-president; and Horace Butler, secretary-treasurer.

New Plant Site

CARTER-WATERS CORP., Kansas City, Mo., has purchased a 12-acre tract where an industrial development amounting to $1,000,000 is planned, so that all corporation activities, with the exception of a new plant under construction in Platte County, can be shifted to the one site. The first unit being constructed is a new plant for the production of Haydite concrete block, according to Albert R. Waters, president of the corporation.

Gravel Plant Opens

BOLD BROTHERS SAND AND GRAVEL PLANT, owned and operated by Howard and Roy Bold, has started the production of sand, pea gravel, aggregate and oversize at Garrison, N. D., following the installation of a $20,000 Cedar Rapids washing and screening plant. Daily capacity is 600 tons.



Aerial view of new Macatee, Inc., plant at Dallas, Texas. Office, foreground; warehouse, right; and mortar plant, rear

Stone for Levee Repair

THREE CONTRACTS for replacement and repair of levees along the Missouri river have been awarded, it was announced by Col. W. E. Potter, district engineer of the Kansas City district of the U. S. Engineer Corps. Tobin Quarries, Inc., Kansas City, received a contract in the amount of $55,678.90 for work in the vicinity of Grand Pass; Knutson-Gould Construction Co., was awarded a contract for work in the vicinity of Arrow Rock to cost $60,768.40; and Dean Construction Co., North Kansas City, was awarded the third contract for work in the vicinity of Jefferson City amounting to $60,321.66.

Building Kyanite Plant

COMMERCIALORES, INC., recently established group for the purpose of developing a large kyanite deposit near Clover, S. C., has elected Reeve Hoover as chairman of the board. The company reports that satisfactory progress has been made in building a plant at the mine site. Development of an ore body of considerable size that is rich in kyanite and low in percentages of contaminating materials will allow the company to stress quality of finished product. It is expected that quantity deliveries of various types of kyanite concentrate will be possible soon after the first of the year.

Open Feldspar Mine

APPALACHIAN MINERALS CO. plans to start operation of its new feldspar mine near Monticello, Ga., early this Spring. The mine will represent a new industry for the state of Georgia, and is located on a deposit of exceptionally pure ore. An important feature of the deposits is their high potash-soda ratio, being 6 to 1 or greater. By-products will be quartz and mica. With the discovery of feldspar in Georgia, the state will produce 85 per cent of all raw materials needed for the manufacture of pottery.

Appalachian Co. holds a 20-year lease on deposits covering 10 miles in Jasper County. Because of the pure state of the deposit, the dry process will be used; with no need for wet or flotation processes for a number of years, according to L. P. Warriner, president. Discovery of the deposits was made by B. C. Burgess, vice-president and general manager of the company.

Copper Slag Wool Plant

UTILIZING copper slag waste as the basic material, Independent Insulations, Inc., Tacoma, Wash., is producing rock wool insulation. The slag, formerly dumped as waste by the Tacoma ore smelter, is mixed with quartz silica, basalt and limestone and fuel in a cupola-type furnace. The limestone serves as the flux to make the molten rock, heated to 2600 deg. F., flow freely.

The 55-in. cupolas are water cooled, and can handle 4500 lb. of raw material per hour. Molten rock is blown by high pressure steam into chambers 75 ft. long, 35 ft. high and 10 ft. wide.

Experiments indicated, it is claimed, that rock wool made with the copper slag as a base made possible packing it to a low density, which makes for more insulating space. Consumption of slag will amount to about 3000 tons per month at capacity operations. Charles J. Rusden, Seattle, is president of Independent Insulations.

Sand Dredging Ban

SAND DREDGING operations in Lake Erie are to be banned in 1948, it was announced by George B. Sowers, state director of public works, Ohio, who charged that dredging was one of the contributory causes of erosion that has scarred the Ohio shoreline. He also stated that Col. H. D. Vogel, U. S. Army district engineer for the district including Cleveland, said that no navigation permits will be issued to sand dredging companies for 1948 unless the state indicates its approval.

Coming Conventions

American Concrete Pipe Association, 40th Annual Convention, Hotel Roosevelt, New Orleans, La., March 11-13, 1948.

American Concrete Institute, 44th Annual Convention, Shirley-Savoy Hotel, Denver, Colo, February 23-26, 1948.

American Road Builders' Association, 45th Annual Convention, Washington, D. C., January 26-28, 1948.

American Road Builders' Association, Exposition of new Construction Equipment, Soldier Field, Chicago, Ill., July 16-24, 1948.

American Society for Testing Materials, Annual Meeting and Exhibit of Testing Apparatus and Related Equipment, Book - Cadillac Hotel, Detroit, Mich., June 21-25, 1948.

American Society for Testing Materials, Committee Week and Spring Meeting, Washington, D. C., March 1-5, 1948.

Agricultural Limestone Division of National Crushed Stone Association, 3rd Annual Convention, Netherland Plaza, Cincinnati, Ohio, January 29-30, 1948.

National Agricultural Limestone Association, 3rd Annual Convention, Hotel Statler, Washington, D. C., January 14-15, 1948.

National Concrete Masonry Association, Annual Meeting, Hotel New Yorker, New York, N. Y., March 1-3, 1948.

National Crushed Stone Association, 31st Annual Convention and Exposition, Netherland Plaza, Cincinnati, Ohio, January 26-28, 1948. Exposition January 26-30.

National Industrial Sand Association, Annual Meeting, The Homestead, Hot Springs, Va., May 12-14, 1948; Semi-Annual Meeting, The Greenbrier, White Sulphur Springs, W. Va., October 20-22, 1948.

National Lime Association, Operating Division, Gibson Hotel, Cincinnati, Ohio, January 29-30, 1948; Annual Convention, The Homestead, Hot Springs, Va., April 5-7, 1948.

National Sand and Gravel Association, 32nd Annual Convention, Netherland Plaza, Cincinnati, Ohio, January 20-22, 1948.

National Ready Mixed Concrete Association, 18th Annual Convention, Netherland Plaza, Cincinnati, Ohio, January 21-23, 1948.

Sand-Lime Brick Association, Convention, Roanoke Hotel, Roanoke, Va., January 26-28, 1948.

Convention Programs

(Continued from page 75)

assistant to the president, White Motor Co., an open forum on ready mixed concrete specifications and production problems will be conducted. An informal round-table discussion, it will be opened by brief talks as follows: "The Revised A.S.T.M. Specifications for Ready Mixed Concrete," Stanton Walker, and "Use of Ready Mixed Concrete in Highway Construction," J. F. Barbee. Topics suggested for discussion are: "Measurement of Mixing Water," "Control of Entrained Air; Effect of Length of Haul on Entrained Air," "Accuracy of Batching, with Particular Reference to Cement," "Uniformity of Strength Tests Made Either as Check on or as Basis of Acceptance for Ready Mixed Concrete," and "Transportation of Concrete in Non-Agitating Equipment." Election of officers will end the meeting.

In addition to the regular convention program, a special entertainment program is being planned for the ladies in attendance under the direction of the Ohio Sand and Gravel Association.

EXHIBITORS

Name of Company	Booth No.
Allis-Chalmers Manufacturing Co., Milwaukee, Wis.	24-25-26-27-28
American Hoist & Derrick Co., St. Paul, Minn.	248
American Manganese Steel Division of The American Brake Shoe & Foundry Co., Chicago Heights, Ill.	23
Barber-Greene Co., Aurora, Ill.	12
Blaw-Knox Co., Pittsburgh, Penn.	13-14-15
Bucyrus-Erie Co., South Milwaukee, Wis.	34-35
Butler Bin Co., Waukesha, Wis.	251
Chain Belt Co., Milwaukee, Wis.	46-47
Concrete Transport Mixer Co., St. Louis, Mo.	46-47
Conserco, Inc., Washington, D. C.	39
Deister Machine Co., Fort Wayne, Ind.	31-32
Dewey & Almy Chemical Co., Cambridge, Mass.	250
Diamond Iron Works, Inc. Mahr Manufacturing Co. Division, Minneapolis, Minn.	38
Dravo Corporation, Pittsburgh, Penn.	238
Dumpcrete Division Maxon Construction Co., Dayton, Ohio	52
Eagle Iron Works, Des Moines, Iowa	247
General Electric Co., Schenectady, N. Y.	255-256
Gruendler Crusher and Pulverizer Co., St. Louis, Mo.	42
George Haiss Manufacturing Co., Inc., Bronx, N. Y.	41
Harristeel Products Co., New York, N. Y.	43
Hendrick Manufacturing Co., Carbondale, Penn.	4
Hercules Steel Products Corporation, Galion, Ohio	51
Insley Manufacturing Co., Indianapolis, Ind.	37
Iowa Manufacturing Co., Cedar Rapids, Iowa	16
The Jaeger Machine Co., Columbus, Ohio	46-47
C. S. Johnson Co., Champaign, Ill.	244
Kensington Steel Co., Chicago, Ill.	17-18
Koehring Co., Milwaukee, Wis.	245-246
A. Leschen & Sons Rope Co., St. Louis, Mo.	29-30
Lima Shovel and Crane Division Lima-Hamilton Corporation, Lima, Ohio	242
Link-Belt Co., Chicago, Ill.	1-2-3
Ludlow-Saylor Wire Co., St. Louis, Mo.	240
Marion Power Shovel Co., Marion, Ohio	6
Master Builders Co., Cleveland, Ohio	252-253-254
McLanahan & Stone Corporation, Hollidaysburg, Penn.	235
New Holland Manufacturing Co., Mountville, Penn.	44-45
Nordberg Manufacturing Co., Milwaukee, Wis.	33
Pioneer Engineering Works, Inc., Minneapolis, Minn.	10-11
Pit and Quarry, Chicago, Ill.	B
Precision Instruments Sales Co., St. Louis, Mo.	49
Ransome Machinery Co., Dunellen, N. J.	46-47
Robins Conveyors Division Hewitt-Robins, Inc., Passaic, N. J.	9-19
Rock Products, Chicago, Ill.	A
John A. Roebling's Sons Co., Trenton, N. J.	20
Sauerman Bros., Inc., Chicago, Ill.	8
Screen Equipment Co., Buffalo, N. Y.	241
Simplicity Engineering Co., Durand, Mich.	243-249
T. L. Smith Co., Milwaukee, Wis.	46-47
Smith Engineering Works, Milwaukee, Wis.	21
Stedman's Foundry & Machine Works, Aurora, Ind.	22
W. O. & M. W. Talcott, Inc., Providence, R. I.	239
Taylor-Wharton Iron & Steel Co., High Bridge, N. J.	5
Thew Shovel Co., Lorain, Ohio	236-237
Truck Mixer Manufacturers' Bureau, Washington, D. C.	46-47
The W. S. Tyler Co., Cleveland, Ohio	7
Universal Engineering Corporation, Cedar Rapids, Iowa	36
White Motor Co., Cleveland, Ohio	48

In addition to those listed above, the following companies will have displays at the National Crushed Stone Association convention exhibit to be held January 26 to 28 in Cincinnati following the National Sand and Gravel Association and the National Ready Mixed Concrete Association conventions:

Company Name	Booth Assignment
American Cyanamide Co.	20
Atlas Powder Co.	13-14
Bacon-Pietsch Co., Inc.	48
Cummins Engine Co.	38
E. I. DuPont de Nemours & Co., Inc.	238
Easton Car & Construction Co.	29-30
Euclid Road Machinery Co.	39-40
Frog, Switch & Mfg. Co.	8
Harnischfeger Corporation	49-50-51
Hercules Powder Co.	247-248
Jeffrey Mfg. Co.	252-253
Kennedy-Van Saun Mfg. & Eng. Corp.	15
Keystone Driller Co.	46-47
Northern Blower Co.	22
Sanderson-Cyclone Drill Co.	244
Traylor Eng. & Mfg. Co.	250-251
Vibration Measurement Engineers	52

National Crushed Stone Association program on page 125.

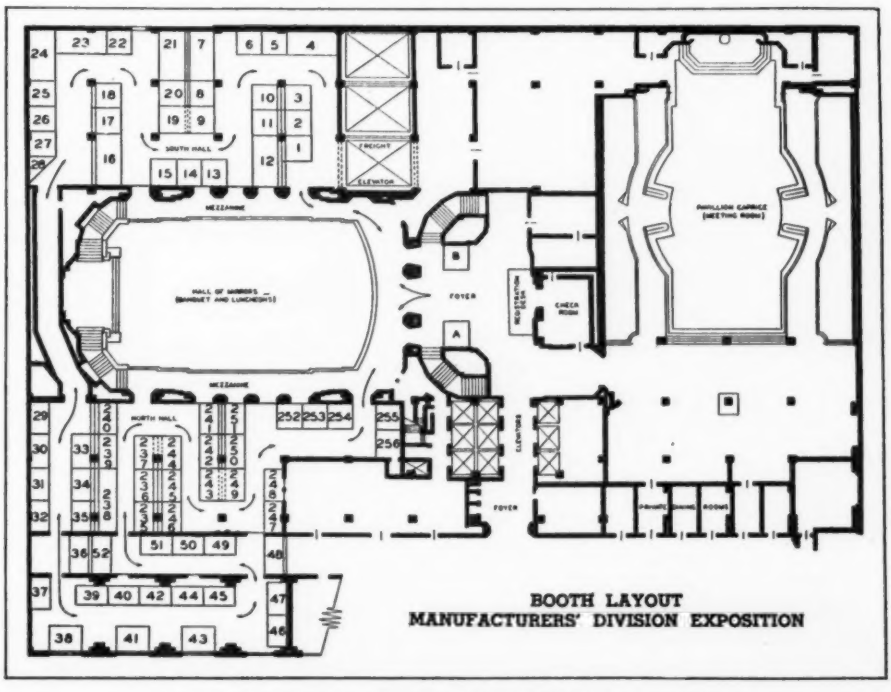
Lease Fluorspar Properties

ALUMINUM ORE CO., Fluorspar Division, Rosiclare, Ill., has acquired lease and option on an aggregation of small Kentucky fluorspar properties, known as the "Howard Group," where diamond-drill prospecting will be started shortly.

Pavement Yardage

AWARDS of concrete pavement for November and for the first eleven months of 1947 have been announced by the Portland Cement Association as follows:

	Square Yards Awarded During Nov. 1947	Square Yards Awarded During First 11 Months of 1947
Roads	1,591,593	20,085,085
Streets and Alleys	752,309	13,700,229
Airports	5,300	1,458,743
Total	2,349,202	35,244,057



Layout of booths of exhibitors at Cincinnati, Ohio, conventions

HINTS and HELPS

PROFIT-MAKING IDEAS DEVELOPED BY OPERATING MEN

Drop Ball Wear

AT AN EASTERN QUARRY, a drop ball was used for all the secondary stone breaking with both an octagon shaped ball and a spherical ball being in serv-

Drop ball rapidly wears round at the bottom

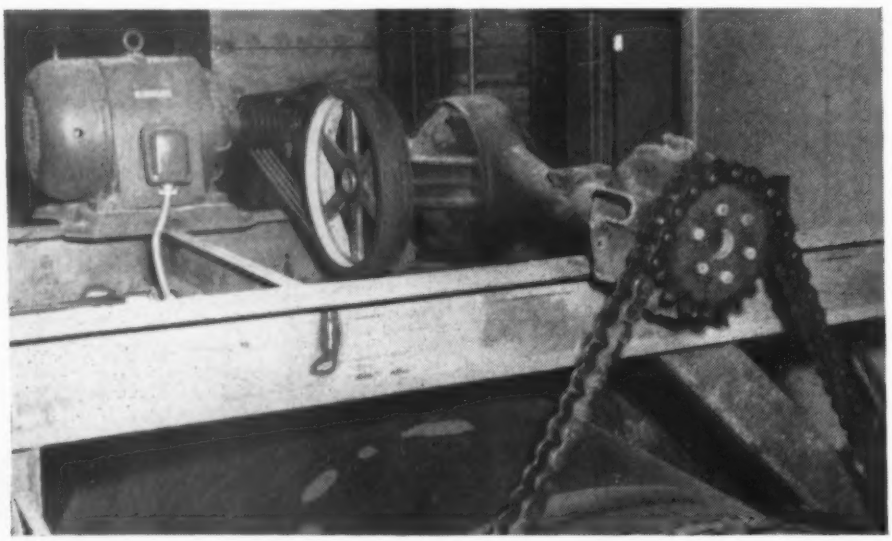
ice. When inquiry was made as to which was the best, the quarry operator reported that it did not make much difference, pound for pound, as the octagon shaped drop ball originally had a flat bottom but very soon wore to a spherical shape. This 6000-lb. ball had lost several hundred pounds in its comparatively short life, indicating that possibly manufacturers could give some thought to this subject and supply a ball of such weight, material and design which would hold its shape longer. The illustration shows the character of this wear.

Loading Pocket

AT a sand and gravel plant in the Pacific Northwest, a 3-cu. yd. Sauerman slackline cableway scraper bucket delivers to a grizzly over a pan feeder serving the plant. The belt conveyor system to the plant is at right angles to the wire rope lines on the scraper bucket. At times it is desirable to load pit run sand and gravel direct from the scraper bucket so a

Steel "pocket" to hold sand and gravel

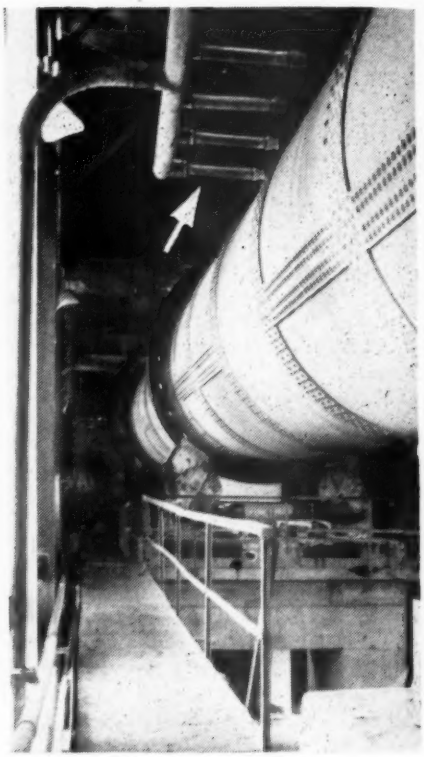
steel "pocket" has been built as indicated in the illustration. The scraper bucket loads this pocket, and trucks can be spotted under the loading gate.



Motor, V-belt, truck axle and chain drive cooler through segmental gear around shell

Cooling Kilns

ON THE LONG KILN operated by Lawrence Portland Cement Co., (the subject of a lengthy article in the



Stream of air from low-pressure nozzles, to the left, serve to cool firing end of kiln

March, 1947, issue of ROCK PRODUCTS) a series of six low-pressure air nozzles have been located near the firing end to blow a stream of air on the outer shell near the hot end. These nozzles were assembled from pipe and fittings as shown in the illustration, and provide a simple means of lowering the temperature of the outside of the kiln.

Gear Reducer for Cooler

STANDARD SAND CO., Benton Harbor, Mich., has an interesting gear reduction set-up for the cooler in its core sand drying plant near Grand Haven, Mich.

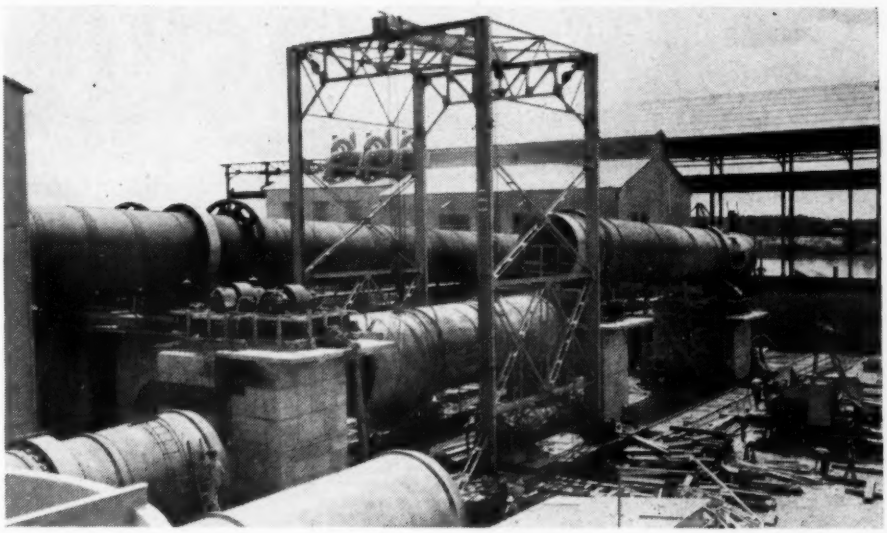
As shown in the illustration, the 10-hp. G.E. motor and gear reducer was mounted above the 6- x 20-ft. rotary cooler on an H-frame of I-beams supported on a steel I-beam superstructure from the concrete footings. The cooler, operating at 7 r.p.m., is driven by the electric motor through a 3:1 V-belt to an Eaton truck axle with a 6:2 reduction and thence to a chain driving a segmental gear around the cooler. This arrangement for the drive was found necessary due to the limitations of space and the difficulty of obtaining gear reducer equipment at the time the plant was built.

Erect Rotary Kiln By Gantry Crane

GENERAL PORTLAND CEMENT CO., in placing a $1,250,000 expansion program in operation at its Tampa, Fla., plant, has erected a 12-ft. diameter, 426-ft. long oil-fired rotary kiln with the aid of an ingenious gantry crane.

The gantry structure, mounted on two standard 50-ft. railroad flat cars, which also support the standard 5-ton hoisting engines used in raising sections of the kiln into position, operates on standard gage railroad track over carefully compacted soil. Lifts required in erecting the nine kiln sections ranged from 32 to 89 tons and were placed at elevations up to 52 ft. above the track level. The gantry framework, weighing 33 tons, was a 30-ft. span with an over-all vertical clearance of 55 ft., and is 40-ft. long.

More than 1200 timber piles, driven to an average depth of 18 ft., support the reinforced concrete kiln foundations. Kiln layout includes a reinforced concrete burner building 40- x 64-ft., 60-ft. high, designed to take lifts up to 25 tons, in the servicing and maintenance of equipment; a kiln drive building, 44- x 68-ft. and 66-ft. high; and a 20-ft. slurry tank.



Raising sections of rotary kiln shell on reinforced concrete piers

Air Agitator for Cement

A READY MIXED CONCRETE PLANT recently visited by one of the editors had an interesting arrangement for aerating bulk cement bins. The storage tank was supported about 8 in. above the ground. Delivery to the batcher was by means of a screw conveyor and bucket elevator. No trouble was experienced in having the cement hang up as two ¾-in. air lines straddled the screw conveyor below with air jets projecting into the bottom of the tank to aerate the cement and make it free-flowing. This is much better than battering the tank with hammers or even sledges as is often done where cement is not aerated.

Air jets projecting into the bottom of a bulk cement tank prevents cement from "hanging"

Rapid Calculation Of Pump Problems

By P. C. ZIEMKE

THE ACCOMPANYING CHART provides a ready means of determining some pertinent facts on pumping problems. It is a nomograph which indicates the power required to accomplish a pumping job up to 100 h.p. In addition, the amount of water a pump will lift per minute is readily available, as are the head and the efficiency of the drive.

For instance, to find how many gallons per minute a pump can lift when powered by a 30 h.p. motor through a 30 ft. head; the efficiency of the pump being 40 per cent, join the 30 figure in column *A* with the 40 per cent figure column *E* and locate the intersection with column *C*. Next run a line from the figure 30 in column *D* to intersect column *C* at its intersection with the first line. Extension of the new line to column *B* indicates 1650 g.p.m. as the quantity handled.

In assuming efficiencies, use the 80 per cent value for reciprocating pumps of all makes including duplex and triplex models. Air lift units rate 40 per cent and centrifugal pumps rate 60 per cent efficiency. If the efficiency of the pump has been proved before hand that is the figure to use. It is important to remember that one always connects *A* to *E* and *B* to *D*. Or, the outside columns must be used together, and the inside columns together. With any three values established, the fourth is quickly determined without computation.

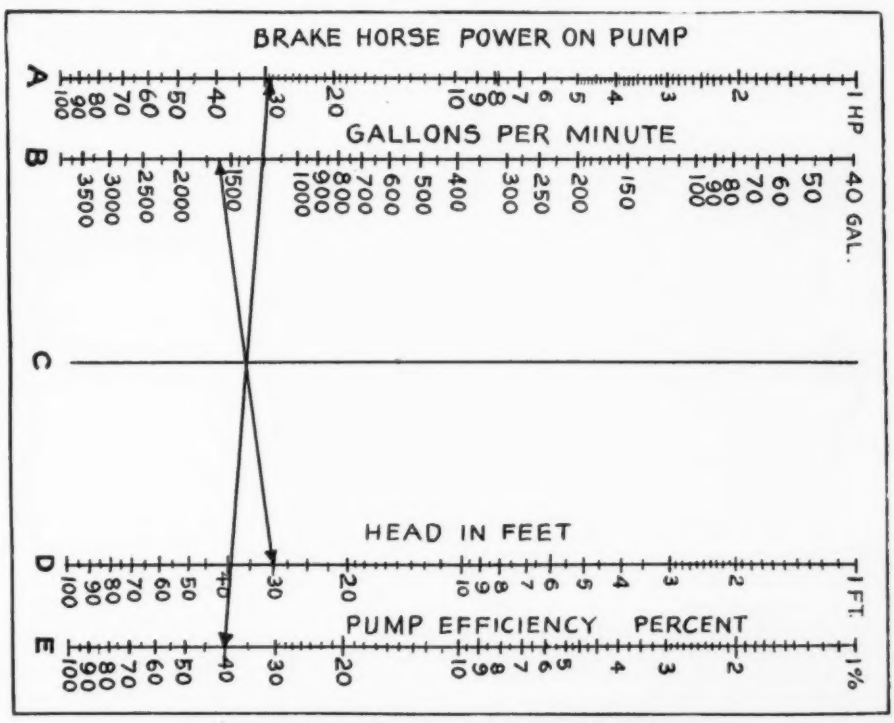
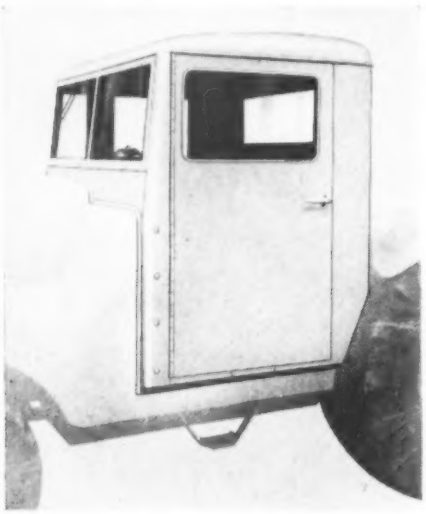


Chart provides ready means of solving pump problems

new MACHINERY

All-Steel Welded Cab

CATERPILLAR TRACTOR CO., Peoria, Ill., has designed an all-steel welded cab for attachment on the new 115-hp. Diesel DW10 wheel-type tractor. The

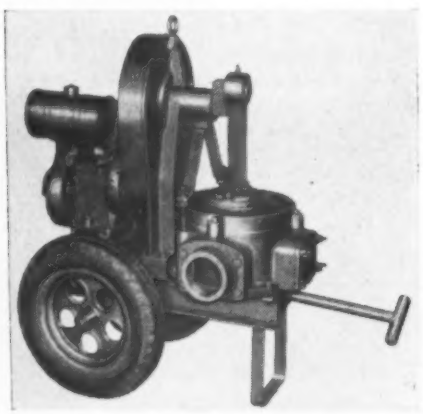


Operator of tractor protected against the elements by all-steel welded cab

cab permits maximum visibility and maneuverability for the operator. The door and side and rear panels are removable.

Diaphragm Pump

THE CARVER PUMP CO., Muscatine, Iowa, has announced a diaphragm pump in 3-in. and 4-in. sizes with a capacity from 1000 to 6000 g.p.m.,



Portable diaphragm pump

which can handle a solid content up to 25 per cent. The only moving part of the pump exposed to gritty water is the durable live-rubber diaphragm which can be quickly and easily replaced if it becomes necessary. Antifriction Timken roller bearings are used on pump rod and in the main transmission. This pump is recommended by the manufacturer for suction lifts up to 20 ft., but it has a maximum suction lift of 25 ft. It is available with gasoline engine, electric motor, or without power source, and may be obtained with portable or skid mounting.

Design Off-Highway Truck

INTERNATIONAL HARVESTER CO., Chicago, Ill., has just announced a new four-wheel heavy-duty off-highway truck, model KBR-14. This unit has been specially designed for use in strip mining, construction, quarry and similar off-highway types of service as a truck-tractor or straight truck, according to the manufacturer. The KBR-14 has a gross vehicle weight rating range of 32,000 to 41,600 lb., depending upon the type of service and severity of conditions under which it is expected to operate. It is available in three wheelbases, namely, 161-, 179-, and 215-in., with cab to axle

Heavy-duty truck for off-highway service

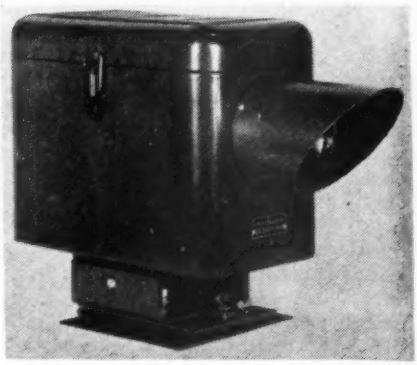
dimensions of 72-, 90-, and 126-in., respectively.

The new truck is powered by a six-cylinder International-Continental R-6586 valve-in-head engine. Bore is 4 13/16-in.; stroke 5⅜-in.; piston displacement 586-cu. in. Maximum brake horsepower is 200 at 2600 r.p.m., with maximum torque of 475 lb.-ft. at 1000 r.p.m. Cooling is by centrifugal water pump with fan belt drive and the thermostat is located in the outlet manifold. Cummins HB-600 Diesel engine will be supplied as optional equipment.

Frame of model KBR-14 is of double-channel, straight type, 10-in. deep with section modulus of 24.79. Heavy-duty springs and mountings are specially designed for the severe service in which this model will be used, according to the manufacturer.

Photoelectric Relay

GENERAL ELECTRIC CO., Schenectady, N. Y., announces a new photoelectric relay and light source operating on the modulated light principle. It is claimed that when operated at a



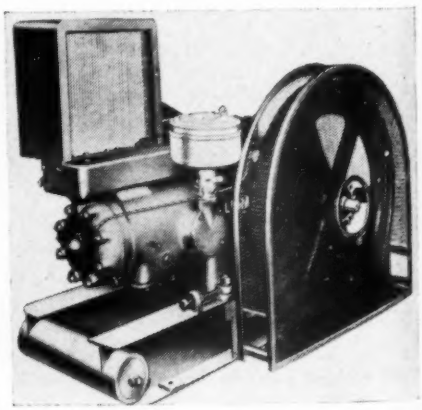
Fully protected long range photoelectric relay

distance up to 1000-ft., this equipment has sufficient sensitivity to prevent false operation due to rain, fog or snowfall. The light source contains a lamp, transformer, and motor-driven slotted disk which interrupts (or modulates) the light beam at about 900 cycles per second, and is fitted with a tuned circuit which allows the relay to be responsive only to a light beam modulated at this frequency.

It is claimed that the new cell is not sensitive to changes in natural or artificial illumination. The units are mounted in outdoor enclosures which are equipped with a universal mounting.

Multi-Fuel Engine

WHITE-ROTH MACHINE CORPORATION, Lorain, Ohio, has brought out a heavy-duty line of single cylinder horizontal, two-cycle, multi-fuel engines.



Engine designed to use natural gas, butane or Diesel fuel

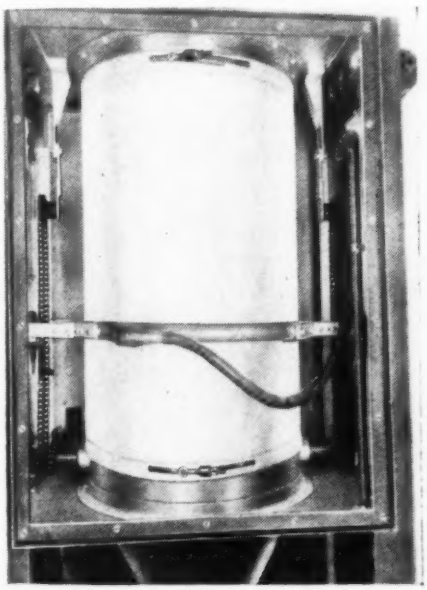
The first model, Lorain Type L, now in production, will operate on Diesel fuel, natural gas or butane. This engine has a rating of 10.7 hp. at 300 r.p.m. and 21.4 hp. at 600 r.p.m. It has a 7½-in. bore and 8-in. stroke, and is equipped with Timken bearings on crankshaft and cross shaft. "Wet"

cylinder liners can be replaced in the field. A condenser type cooling system is said to eliminate the need for a water pump and make-up water is negligible.

Dust Collector Uses Felt Filter

PULVERIZING MACHINERY CO., Summit, N. J., has developed what is known as the Mikro-Collector. This collector is claimed to embody in its design the first commercial, successful application of hard-pressed wool felt as a filter medium.

Heretofore, felt has been considered a good filter medium but its pores were so small in relation to its thickness that they clogged up. In the Mikro-Collector this problem is said to be solved by the use of a hollow, annular blow ring which hugs and flexes the cylindrical belt bag while moving up and down its outer surface by means of conventional chain and



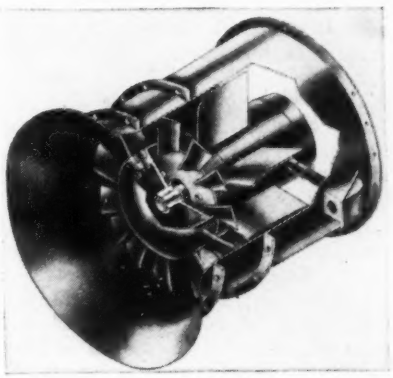
Interior of collector showing cylindrical felt filter bag, bag fasteners, and blow ring

sprocket drive. Around the inner periphery of the blow ring is a narrow slit through which is directed a jet of air supplied by a positive pressure blower. This counter-current of air is conveyed to the blow ring by a flexible hose and is designed to assure a perpetually clean bag. No portion of the filter surface need be cut off for cleaning or shaking during the filtering operations.

In operation either positive or negative pressure may be used to induce the air-flow through the bag. Dust-laden air, admitted through an opening in the roof of the cabinet, is caught in the radially directed air stream and swept against the inner surface of the bag. Some of the particles cling to the fabric, forming a dust layer. This is dislodged by the flexing of the belt and the air-blast from the blow ring, and falls into the conical discharge hopper.

Adjustable Blade Fans

JOY MANUFACTURING CO., Pittsburgh, Penn., has announced the "Axivane" adjustable blade fans, series 1000, for all heating, ventilating, and



Cutaway view of axial-flow fan

air conditioning requirements. The adjustable blades are said to insure great flexibility in performance. This series consists of axial-flow fans of the vaneaxial type designed for a range of pressures up to 9.60 water gauge and volumes up to 100,000 c.f.m. They are available in 124 different models from various combinations of 15 different housing diameters, 18- to 60-in., four hub sizes, 16 motor frame sizes, and four different speeds.

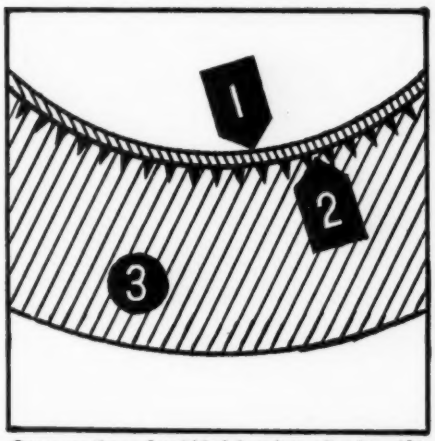
Lightweight Shovel

THE OSGOOD CO., Marion, Ohio, has added to its line the Type 5, Model 5C, ⅜-cu. yd. excavator. The Type 5 is a fast, easily maneuverable, lightweight machine for excavating and material handling jobs that are not profitable for the larger excavators. It is available as a shovel, dragline, clamshell, crane, and hoe, and is readily interchanged from one class to another.

All main operating machinery is positioned on a welded deck. It may be powered with either gasoline or Diesel engine, and twin disc clutches activate the swing, travel, and hoisting motions. A new patented principle in rope crowding mechanism is employed. Racking and drums on the boom have been eliminated, and the ropes are arranged to give a direct, positive, independent crowding action.

Gridded Bearings

NATIONAL BEARING DIVISION, American Brake Shoe Co., St. Louis, Mo., has developed a gridded babbitted bearing which is said to have many advantages. The idea is not new but the application to production manufacture required considerable research. This was done by gridding a centrifugally cast lead-tin bronze to combine its advantages with those of babbitt. To increase further the seizure resistance and corrosion resistance of gridded bearings, the engineers of the company added a 0.002-in. run-in surface of lead-tin electroplated in the bore. The cross-section



Cross section of gridded bearing, showing (1) lead-tin alloy "run-in" surface; (2) precision-spaced grids filled with silver babbitt; and (3) centrifugally-cast lead-bronze shell

appearance of this three-layer bimetallic construction is shown in the illustration. Present applications of gridded bearings are main and connecting rods of heavily-loaded Diesel engines and for similar heavy-duty service. The manufacturer advises that these bearings are now operating under loads of over 3500 p.s.i. projected area with shafts as low as 160 Brinell hardness.

Small shovel with conveniently located operating controls

Car Shake-Out

ROBINS CONVEYOR DIVISION, Hewitt-Robins, Inc., Passaic, N. J., has announced new applications for its car shake-out, a portable electric-powered

Emptying hopper-bottomed cars quickly with shake-out at glass plant

machine that empties hopper-bottom railroad cars very quickly by applying vibration. As shown in the illustration, the shake-out is lowered into place over the sides of the car by a hoist. The illustration shows silica sand being unloaded at the Rossford plant of Libbey-Owens-Ford Glass Co.

Flexible Rock Drill

SALEM TOOL CO., Salem, Ohio, offers the McCarthy rock boring machine to the quarry industry with the statement that it operates effectively in clay, sandrock and limestone, producing 40 per cent more holes per day in soft or hard stone. The new drill is powered by 25- or 32-hp. air-cooled Wisconsin gasoline engine that turns at 200 r.p.m. The carriage is of welded steel construction with heavy channels and plate and is 12-ft. long by 24½-in. wide.

Drill motor unit is hydraulically controlled with a travel of 8-ft. Hydraulic pump is driven by power take-off from transmission with automatic stops on each end of cylinder that are claimed to eliminate danger of building up excess pressure which may cause mechanical failure. Four jacks to raise or lower unit are standard equipment, with self-locking worm gear. Drill head rotates from a low speed of 15 r.p.m. to a high speed of 400 r.p.m., handling 4- to 12-in. augers. The manufacturer states that due to the patented design of the hydraulic ram, the machine needs less working space; and it has the necessary weight (4000 lb.) to operate faster and more economically.

The drill can bore holes vertically or horizontally; and is available in self-propelled, truck-mounted or trench-type models.

Flexible rock drill offered to quarry industry

Flexible Tubing

RONAFLEX TUBING CO., INC., Philadelphia, Penn., has developed a flexible tubing which is said to have the flexibility of rubber and the sturdiness of steel. Ronaflex tubing has been tested up to pressures of 980 p.s.i., without leakage or damage, according to the manufacturers, and can be bent, kinked or twisted. It consists of a tough synthetic rubber tubing protected by a strong steel wire braid cover to withstand abrasion. This tubing has been used for engine fuel and oil lines and many other purposes. It is distributed by Penflex Sales Co.

Truck scale made in 40-, 50- and 60-ton capacities

Truck Scale

THE WEBB CORPORATION, Webb City, Mo., is now producing a four-section type truck scale up to 60-ton capacity and 70 ft. long. This model is also made in 40- and 50-ton capacities and from 45 to 70 ft. in length.

Hydraulic Products

LAPLANT-CHOATE MANUFACTURING CO., INC., Cedar Rapids, Iowa, is offering a new line of hydraulic products, including pumps, motors, valves, cylinders and a compact 3-in-1 power unit which incorporates in one design, a pump, control valve and reservoir.

Pumps, motors, and power units are available in four sizes: 15, 25, 40, and 60 g.p.m. Cylinders are available in

Three-in-one hydraulic power unit; reservoir tank above, valve unit, and pump at the bottom

three sizes: 4-, 5-, and 6-in. diameters. Valves come in two sizes, for control of flows up to 50 g.p.m. and 70 g.p.m.

The pumps are designed for automotive, portable or stationary applications, and may be electric motor or engine driven. The power unit incorporates some interesting principles such as surge control, a super-charged pump and small capacity reservoir. Valves are spool-type, three positions (float position optional) and self-centering, and may be obtained with or without automatic surge control. Cylinders are double-acting, and can be mounted in any position. Pistons are ring-type for high pressure sealing with piston rods chrome plated.

Shot-Peened Axle Shafts

DODGE DIVISION, Chrysler Corporation, Detroit, Mich., has announced that shot-peened rear axle shafts,

which are said to more than double the fatigue life of ordinary shafts, are now being used on all the 175 basic chassis models of Dodge trucks.

Six-Wheel Truck

MACK TRUCK CO., New York, N. Y., is now in production on a huge six-wheel off-highway truck designated Model LRSW. The truck was designed to haul overburden and rock in quarrying or similar operations. It carries a 30-ton payload with a dump truck body or pulls 55 tons as a tractor, and is powered with a 275-hp. Cummins NHBS Diesel engine. Wheelbase is 171.62 in., but the turning radius is only 43 ft. Hydraulic power steering makes driving an easy task. Large, low-pressure tires insure a relatively low weight-loading per square inch, giving good flotation qualities.

This six-wheel unit has a heavy-duty balanced bogie which provides self-steering and full-tracking, giving stability regardless of terrain or unbalanced load conditions. Massive springs are mounted in rubber shock insulators. The Mack power divider divides the power between the two axles and four wheels of the bogie. Another feature is the two-plate, pow-

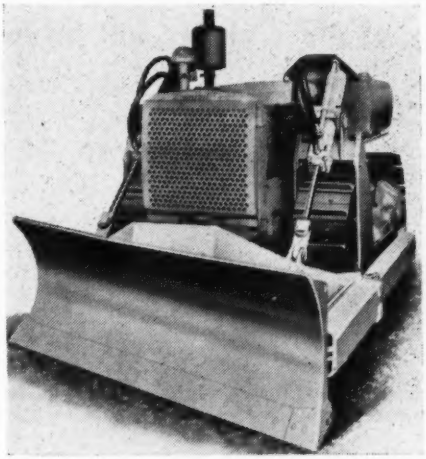
Off-highway truck carried 30-ton payload with dump body

er-assist clutch with a friction surface of 460 sq. in., and a brake system that offers 1509 sq. in. of brake-shoe area. The LRSW is the first post-war off-highway vehicle Mack has released for production. It will supplant the rugged, old Mack FC chain drive off-highway truck of similar weight and capacity.

Hydraulic-Operated Bulldozer

WM. BROS BOILER & MFG. CO., Minneapolis, Minn., has announced that its line of dozers, both straight and angle, are now available for D4 and D6 Caterpillar tractors. The dozer mechanism incorporates the fluid power control provided by the LaPlant-Choate hydraulic pump. The D4 models are claimed to be the only track-mounted, direct-lift, double-acting hydraulic bulldozers with full-floating trunnion rams. The D6 dozer is frame-mounted, and incorporates a compact pump with a minimum of hydraulic piping.

The moldboard fan tail design is offset from the push frame and made wider for ease in maneuvering and less wear. The straddle-mounted cylinder bracket assembly centers lifting



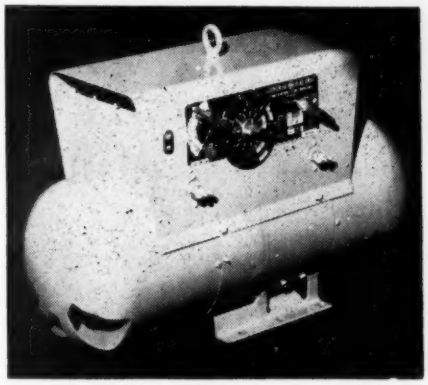
Hydraulically-operated bulldozer has rigid frame with floating moldboard

power and equally distributes working forces. A full-floating hydraulic cylinder assembly permits free movement in all directions.

High-Speed Arc Welders

GENERAL ELECTRIC CO., Schenectady, N. Y., has brought out a line of single-operator, high-speed d.-c. arc welding machines, type WD-40, designed for 50 per cent savings in size and weight and with improved welding characteristics. Operating at 3500 r.p.m., the new welders are available in 200, 300, and 400-ampere models.

The manufacturer points out that

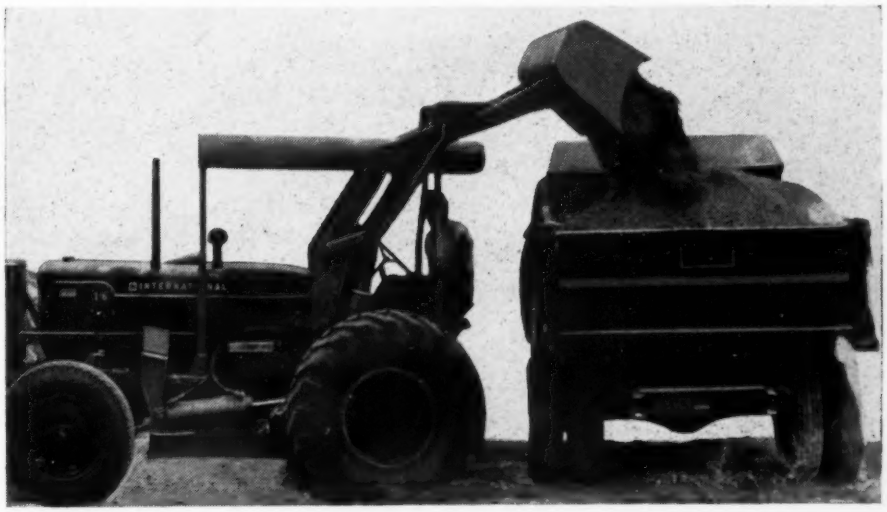


Light-weight d.-c. arc welder with current presetting arrangement

with this welder the arc is easily established and maintained because full arc voltage is generated instantly after short circuit, thereby avoiding unexpected pop-out of the arc. Excessive weld spatter is reduced because current peaks are adjusted for best performance on any setting. A single-dial, dual-range control used on the welder is said to combine flexibility and precision of dual control, with the convenience of single-dial control. This feature makes it possible for the operator to preset the correct current for any given job without having to make other adjustments after the arc is struck.

Overhead Loader

MARION MACHINE CO., Marion, N. C., has designed its overhead loader for adaptation to the International Harvester I-6 tractor. The unit is arranged so that when mounted on the tractor most of the weight is placed between and below wheel centers, giving maximum traction and stability, according to the manufacturer. It has a shock-absorbing arrangement for protection to the front of the tractor while driving over rough ground with loaded bucket or from sudden stopping of bucket while in motion from front to back or back to front.



Overhead loader attachment on tractor loading truck

INCREASED CAPACITY
Will Not Fulfill 1948 Demands

Reports from all sections of the nation indicate many new plants will be built and capacity of older plants will be increased

By BROR NORDBERG

THE YEAR 1948 will be a year of high dollar volume of business but one still beset with operating problems that have prevented maximum output since the war's end. All branches of the industry will, with individual exceptions of course, be operating under forced draft for maximum production and will exceed 1947 production figures to the degree that restrictive conditions — shortages of machinery and repair parts, of labor and car supply, etc.—have been eased. High prices for construction of all classes, and other factors, would have a tendency to restrict volume but demand will continue nonetheless to tax the industry's ability to produce and make delivery.

However, it is to be emphasized that capacity to produce is not the potential capacity of an industry, portland cement for example, but the available capacity from plants which not yet have been brought back to their rated ability to produce because of heavy production demands superimposed in years when rehabilitation has been retarded or sometimes almost impossible of achievement. The equipment supply situation has improved during 1947 and a year hence the industry will be better equipped to keep pace with requirements that, barring unforeseen and unexpected deflation, will impose still heavier demands on production facilities.

Our observations into prospects for business in the immediate year ahead stem from interviews with readers, figures made available from state highway departments and a summary of comments as expressed by producers in reply to our request for expressions as to likely business conditions in their respective localities. Producers were also asked to outline specific operating difficulties encountered and their immediate plans for plant rehabilitation. We are grateful for a generous response.

General Conditions— Construction

A year ago there were predictions that the nation would likely experience a deflationary trend, a mild recession, in 1947 but that did not occur and very few experts in economics now visualize a retardation of the current boom in 1948. There were slight indications of buyers' resistance to high prices, particularly for construction, but 1947 wage and price increases in the coal and other industries started a new wave of price increases generally and the trend continues upward.

Currently, American industry is producing nearly to the utmost of its capacity, construction of housing is approaching previous records and 60 million people are gainfully employed. The effort to satisfy accumulated demands for almost everything has reached a tempo which leaves very little reserve of manpower and raw materials for plant expansion and increase in the productive capacity of industry. Some shortages, among them gypsum rock lath, soil pipe and other construction commodities, have again appeared in serious proportions as a result of stimulated construction activity the latter part of 1947.

Industrial, agricultural and chemical outlets for products of the nonmetallics minerals industries will continue at high demand levels, and construction, which constitutes the major outlet for the bulk of producers will continue at a high level of activity. Great advances in construction activity took place in 1947 and a continued high rate in 1948 will represent continued satisfactory progress.

F. W. DODGE CORPORATION'S estimates of 1948 construction volume, as expressed in a paper "The Year Ahead," by Thomas S. Holden, president, before the Construction Industry Advisory Council of the United States Chamber of Commerce, on November 19, 1947, indicate quite moderate increases over 1947 volume. As Mr. Holden expressed it, this is not only the most probable trend but the one most conducive to sound recovery and sound expansion of activity after 1948. If present strong inflationary forces should develop into an inflationary construction boom in 1948, the necessary corrective setback might be a very serious one in his opinion.

Dodge's advance estimates are

Ball mill installation used on Pacific Coast to reduce pea gravel to sand, a practice which will be followed [illegible]

based on dollar volume of contracts in the 37 Eastern states. A nine per cent increase over 1947 is estimated for non-residential building. A 14 per cent decline in dollar volume of manufacturing buildings in 1948 is estimated along with increased contract volume for commercial buildings and the various classes of public and institutional buildings.

For residential building as a whole, a four per cent increase in dollar volume over 1947 is estimated, including an estimated 14 per cent increase in contracts for apartment buildings, hotels and dormitories and a one per cent increase in dollar volume of one- and two family houses. The assumption that rental housing will increase in greater amount than houses for sales is based on the probability that single-family houses will more likely be adversely affected by further cost increases than other categories of buildings. A three per cent increase in number of new dwelling units to be started during 1948 is estimated.

Contracts for heavy engineering projects are estimated to increase seven per cent in dollar volume, and seven per cent is the over-all estimated increase in total dollar volume of all classes of construction. This estimated seven per cent increase in dollar volume, according to Dodge, would indicate that the physical volume of new construction to be started in 1948 would be approximately equal to the physical volume of 1947. A somewhat larger physical volume of completed construction would be expected in 1948 than the amount completed in 1947, if further improvement is made in completion rates.

In 1947, housing completions will represent 90 to 95 per cent of starts as compared to only 56 per cent in 1946. The supply of skilled construction labor will likely remain tight in 1948 and probable improvement in productivity will not affect volume of construction importantly. Farm building is likely to proceed in increased volume in 1948.

Highway Building

Highway construction will continue at levels in excess of 1947 activity according to estimates from state highway departments. A considerable number of states anticipate a continuation of the 1947 rate of construction where a substantial program had already been undertaken. In other states, there will be a stepup in activity dependant upon the availability of contractors and engineers to handle the work or upon the availability of materials and transportation. One state reported that the extent of its road building program will depend upon action of the federal government in providing funds. A 50 per cent increase is anticipated by one of the large eastern states. One state reporting anticipates slightly less construction in 1948 and another expects that restrictions on materials will be imposed that will result in lowered construction activity.

Huge programs encompassing construction over several years are already in effect and highway departments are envisaging expenditures of many millions of dollars, covering the cost of long-time programs. Oregon, for example, will require an expenditure of one-half billion dollars to complete its highway system, according to a progress report submitted, of which $53,500,000 is to be expended in a new 3-year program. Arizona will have spent a record $10,000,000 of $24,000,000 available at the end of 1947. Programs involving monthly expenditures of a million or two dollars are common in even the smaller states.

• Manufacturers and producers are invited to contribute comments and to suggest solutions to problems as set forth herein. Names of companies will be made available on request.—The Editor

Producers in all branches of the rock products and concrete products industries, without exception, predict that 1948 would be an excellent business year and the majority anticipate capacity operation. The year 1948 will be the "best yet" or "busiest in history" according to some and, in other cases, would be a continuance of a capacity volume year in 1947. Large suppliers of aggregates in some areas are entering 1948 with uncompleted highway contracts and one sand and gravel producer reported that his volume of business in 1947 tripled 1946 tonnage and will be still greater in 1948.

Operating Handicaps

Inability to meet demand is prevailing in many plants and is one of the chief obstacles encountered. Labor, fuel and power supply are not the handicaps to operation that they were when the editors surveyed the industry a year ago although the availability of labor and its unsatisfactory productivity still are complicating factors in some operations. High labor costs and excessive fuel prices are serious and are being reflected in improvement programs underway or contemplated.

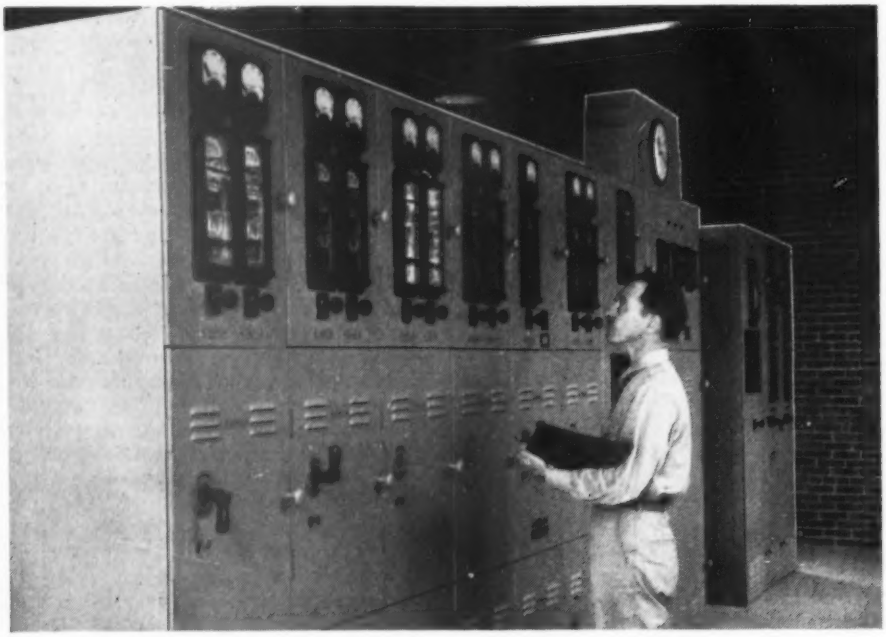
One of the biggest obstacles to capacity operation, in 1947, and one that will continue to be a handicap in 1948 is the shortage of railroad cars, particularly open top gondolas and, in some instances, bulk cement cars. The national picture on railroad equipment is not good yet. During the year ended October 1, 1947, the total supply of serviceable freight cars owned by Class I railroads declined by approximately 20,500. Demands for box cars exceed available supply and the average daily shortage of all types of freight cars has been running about 41,000, according to the Construction Division, Office of Domestic Commerce. The breakdown as of December was 23,000 box cars and 18,000 open top cars. There is an extremely heavy demand for open top cars, reflecting near-record coal movement, large requirements for sand and gravel, crushed stone and lumber, and other peak demands.

In September, 1947, 7,597 new cars were delivered to all railroads and car lines, which was the largest number yet for any single month. During September, for the first time in 25 months, installation of new cars by Class I railroads and railroad-owned and controlled refrigerator car lines exceeded retirement of cars, resulting in a net gain in freight car ownership for the month. Net additions to car supply from the 10,000 cars-a-month program set will be insufficient for at least a year to remove car shortages with production continuing at present levels.

The car shortage and the increased freight rates will reflect in the comparative tonnages of aggregates moved by truck and rail. One sand and gravel producer, with four plants, reports that 25 per cent greater tonnage moved by trucks in 1947 from its plants than in the previous year.

Many producers are yet unable to secure needed new machinery and equipment although it is evident that the situation is improving. Where new machinery has been available, great ingenuity is often required to make the changeover when demands upon plants are such that there no longer is the seasonable shutdown period when rehabilitation normally would have proceeded. The program of rehabilitating plants such as those processing industrial sands that were kept in continuous operation except for emergency repairs throughout the war and since is still the number one problem for some operators. A few complain that equipment is harder to get than during the war.

Repair parts while generally more



Ultra-complete instrument installation for control of rotary kiln operation

available are still difficult for some to obtain, particularly for old machinery. Replacements of lighter equipment such as chain, links, buckets and speed reducers are tight for some, although the supply situation shows day by day improvement. Users of portland cement, the producers of ready-mixed concrete and concrete products, in many areas face a rising volume of business along with a shrinking cement supply and could increase their volume of business in proportion that cement be made available. The large number of different types of cement is necessitating installation of large storage units for separate cements in ready-mixed concrete plants in certain areas. In a few cases the steel shortage has complicated plant rehabilitation.

Plant Rebuilding

Inability to rehabilitate plants has, in certain branches of the industry, prevented attainment of capacities that would ordinarily be sufficient to meet demands even under present peak requirements and one of the disturbing conditions is that capital investment with inflated prices may mean depreciation later on reduced volumes of operation.

Plant installations are contemplated, involving all classes of equipment, to increase capacity but, more significantly, to reduce unit costs and improve quality of product. The industry as a whole is holding the price line far better than other industries, through rehabilitation to remove wasteful operating practices.

It was pointed out in ROCK PRODUCTS a year ago (January, 1947, p. 73) that labor's fraction in total cost of a unit of aggregates had increased about 40 per cent in six years but that plants mechanized and modernized since the war's end had been able to hold labor's fraction of unit cost to 1940 levels even at prevailing high wage scales. A number of producers report that that gain has been effected in 1947 through modernization. One crushed stone producer reports having held down costs to levels prevailing before three consecutive wage increases were granted. It may be anticipated that such accomplishments will be achieved in many plants during 1948.

Among typical equipment to be installed, called to our attention, are feeders and grizzlies in connection with gyratory crusher operation, devices for removal of sticks, coal and other deleterious materials from gravel, grinding equipment for the production of sand from gravel, larger capacity trucks for quarry haulage, large earth-moving scraper equipment, dust collectors, long rotary kilns, soft stone eliminators, etc., etc.

Portland Cement

Portland cement manufacturers ended 1947 with a record production volume, topping the 182,780,000 bbl. produced in 1942, but with slightly lower shipments than that record year because the industry entered 1947 with smaller carryover according to year-end estimates. Several years, five or more, of high activity in filling highway and building construction needs will continue to tax the industry's ability to produce and it will be forced to continue pushing equipment to the limit to fill heavy orders. Machinery breakdowns will continue to be the hazard and most companies are rebuilding equipment piecemeal with minimum interruption to production. Production in 1948 will exceed that for 1947 where plants can be rehabilitated in order to do so.

The industry, according to federal sources, operated at 75 per cent of theoretical capacity in the 12 months ended July 31, 1947, compared with 56 per cent for the preceding 12 months, and its capacity to produce has been rated at some 240,000,000 bbl. annually, which is a reduction of some 20,000,000 bbl. since early depression days.

Labor costs in the industry are low in comparison with other industries, thus enabling cement manufacturers to keep selling prices at reasonable levels. At the end of 1946, wholesale prices of cement were only 19 per cent over the 1939 average compared with price increases of as much as 144 per cent for lumber. Cement price increases in 1947 raised the price level at the mill only 15 per cent as compared to much sharper price increases for other building materials.

For the industry as a whole the year 1947 ended with a gain of about ten per cent in earnings as compared to 1946 results, whereas estimates early in 1947 were that earnings would be substantially the same as in 1946. Price increases helped offset rising costs but the strong upturn in sales has been the real reason for increased profits.

The surge in domestic and industrial construction in 1947 and the high prices for competitive building materials have resulted in a switchover to concrete construction in many cases. Shortages of cement as a result are almost nationwide and particularly severe in the Mountain states and the North Central region.

As a general rule the industry has not had to shut down completely for repairs despite the strenuous production schedules although individual companies have had some loss of production in 1947 due to enforced shutdowns. A minimum of repair work was done last winter by many concerns in an attempt to build inventory and also because machinery was still difficult of attainment.

Dealers orders are weeks behind from many mills and, as we observed in December while visiting northern plants, bulk cement trucks were being turned away empty at a time of the year when these plants would normally be building inventory. Only extremely paralyzing winter weather will enable many mills to enter the year 1948 with appreciable stock in silos which some companies hope for in order to rehabilitate equipment in preference to major breakdowns to come later.

As pointed out in past issues of ROCK PRODUCTS, some companies are increasing capacity while several are rebuilding their plants, not for purposes of capacity, but for improvement of product and increased operating efficiency. Progressive rebuilding of entire cement mills over a period of years is contemplated by some

concerns. Increased costs of supplies like coal are behind the movement to effect better efficiency and that single cost factor, coal, has accelerated a trend toward the adoption of longer kilns and devices for conservation of heat. One cement company recently reported that its break-even point has risen from 40 per cent of capacity to 80 per cent, indicating that a moderate decrease in demand will determine whether or not it will earn a profit when selling at current prices.

It is not our purpose herein to summarize machinery installations to be made, or to publish individual letters received in that regard, but all phases of plant operation are to be effected. Greatest emphasis appears to be in long kilns, instrument controls, grinding equipment of improved efficiency, dust collection, new packhouses and equipment to improve quarry and crushing operations.

A cement manufacturer in New York State, in presenting some challenging subjects in need of discussion, wrote in part:

"We plan to spend about $100,000 on plant improvements largely in increasing facilities for packing cement. Most of this material has been purchased and is on hand. We also figure on installing an addition to our dust collection system in the finishing mill; also a new 350-hp. motor for a newly built tube mill in the finish mill. This will be delivered in February. We also figure on replacing our water supply system. We are investigating the use of grizzlies and feeders to increase the output of our gyratory crusher.

"The balance of our work will be in repairs and replacements of our present operating machinery in order to put it in first class operating condition.

"We are extremely interested in any information regarding increasing kiln production and cutting down on coal consumption of the kilns. We would like to have any data available on the most efficient fineness of the raw material in view of the cost of raw grinding, the wear and tear on machinery and grinding media, and the heavy dust losses in the kiln gases when the raw material is ground excessively fine.

"Also we seek information on the effect of relatively coarse grinding on fuel consumption and on the quality of the cement produced and the minimum raw fineness recommended.

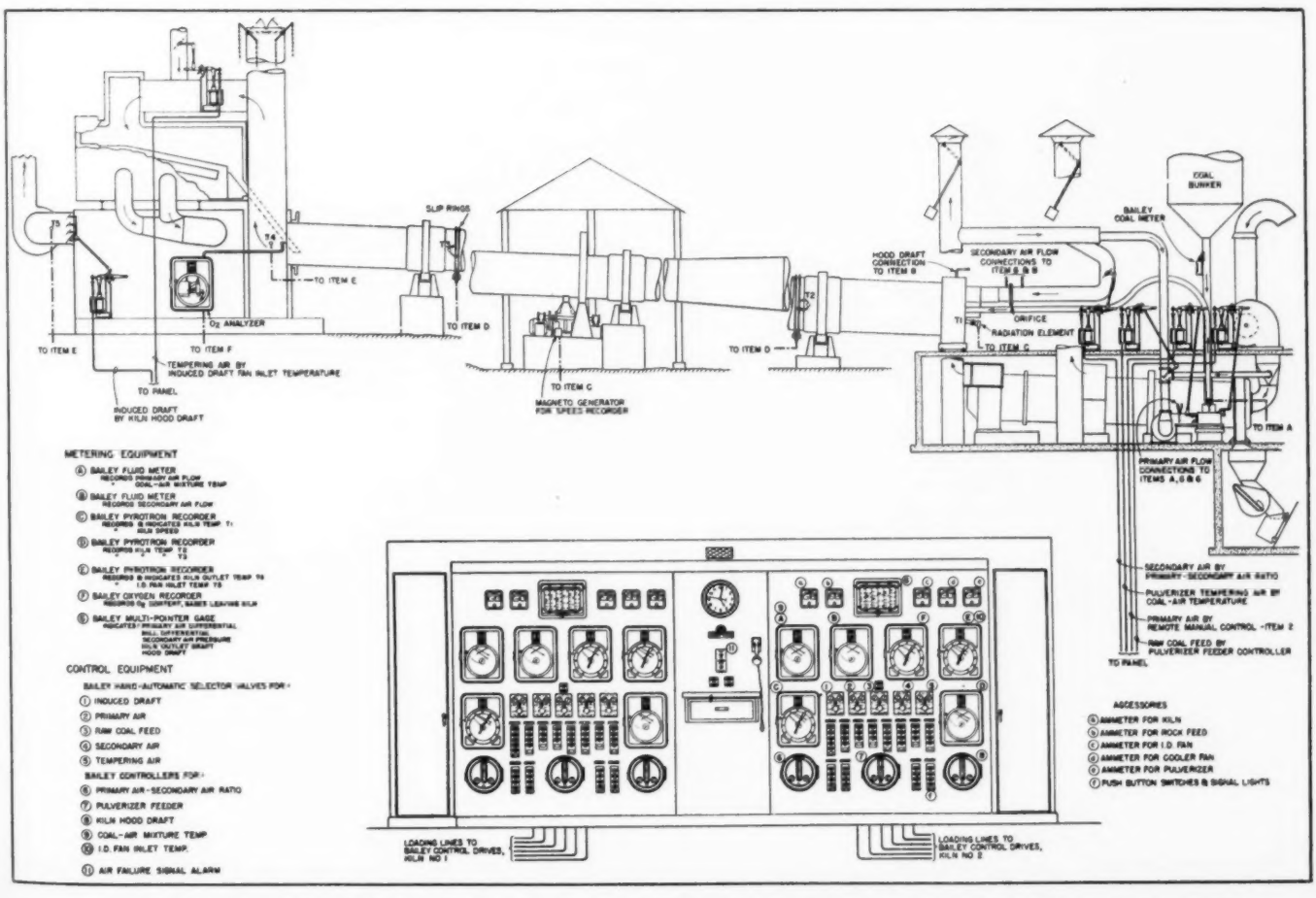
"We figure that our plant will be operating at 100 per cent of capacity for the entire year. The volume will be about equally proportioned between public works and private construction.

'The high cost of construction labor and material costs may be a handicap to the boom to some extent. Labor costs per unit must come down and production must increase in order that everyone may benefit from the possible prosperity to the fullest extent."

A southern manufacturer wrote, typically, as follows:

"Our principal operating problem for the past year has been to produce enough cement to satisfy the demand for it. In that we have failed although our production has been close to our best previous figures. The usual problems, of labor, fuel, power supply and consumption have not been acute and we have been able to maintain good mechanical performance and high quality for our products. Even complaints from customers of shortage and breakage have been very scanty.

"The heavy demand for masonry cement wiped out the margin our grinding mills had over the kilns. We are now completing the installation of a third grinding mill to restore the margin, to permit increasing the production of masonry cement and to resume the production of high-early strength cement. In addition we have just erected, but not yet put in service, a new bridge crane in our storage building, to replace one which is nearly worn out after 20 years of service. Our other rehabilitation plans are modest. We will enlarge our laboratory to give more room for research and customer service work; some worn


SLIP RINGS
TO ITEM E
TO ITEM D
TO ITEM F
TO ITEM G
TO PANEL
COAL BUNKER
BAILEY COAL METER
HOOD DRAFT CONNECTION TO ITEM B
SECONDARY AIR FLOW CONNECTIONS TO ITEMS B & B
ORIFICE
RADIATION ELEMENT
TO ITEM A
PRIMARY AIR FLOW CONNECTIONS TO ITEMS A, B & C
SECONDARY AIR BY PRIMARY - SECONDARY AIR RATIO
PULVERIZER TEMPERING AIR BY COAL-AIR TEMPERATURE
PRIMARY AIR BY REMOTE MANUAL CONTROL - ITEM E
RAW COAL FEED BY PULVERIZER FEEDER CONTROLLER
METERING EQUIPMENT
CONTROL EQUIPMENT
ACCESSORIES
LOADING LINES TO BAILEY CONTROL DRIVES, KILN NO 1
LOADING LINES TO BAILEY CONTROL DRIVES, KILN NO 2

A recent electrical control panel installation for recording power factor and consumption in a lime plant, department by department

shop tools will be replaced; our stacks and some of our structural steel need cleaning and repainting. We plan to install a small bridge crane in our mill room to reduce the labor for handling grinding media, liner plates, etc. Also we put in service this summer a tractor with bulldozer blade and elevating bucket for yard cleanup, keeping our coal storage pile in order and for reclaiming stockpiles of gypsum, sand, etc.

"It appears to us that the demand for cement will continue heavy throughout next year and that only bad weather will permit us to build up any appreciable stock of cement this winter."

Aggregates

Production figures for aggregates —sand and gravel, crushed stone and slag—are not yet available for 1947 but production figures for portland cement and producers' letter would indicate an appreciable increase in volume as compared to 1946 and that further increases are anticipated in 1948. Latest available annual figures for sand and gravel, showed that 187 million tons were produced in 1946 by commercial producers as compared to roughly 152 million tons in 1945 and, for crushed stone, the 1946 total of 177,500,000 tons was an increase of 16 per cent over the preceding year.

Typical letters received from sand and gravel and crushed stone producers follow.

Sand and Gravel

CALIFORNIA—"Our plant operations at the present time are good. We are interested in finding some method of screening sticks and small rocks out of our sand before it goes into the suction pipe on our barge. The balance of our plant is in good operating order.

"The outlook for 1948 in this area seems to be very favorable. We furnish material for plasterers and bricklayers. There is a large amount of commercial building planned for this area in the near future which will keep our sales up for 1948."

* * * * *

CALIFORNIA—"We are planning some improvements and expansion in our production plants. We are investigating the possibility of installing a rod mill to produce certain sizes of sand in which our natural sands are deficient; also we are planning on new shaker screens, new vibration feeders and equipment for gold recovery. Our opinion of the outlook for 1948 is as follows: Public works, fair; private building, good; highways, good, however we do not benefit much from highway construction; residential building, about the same as 1947 with possibly shifts from the cheaper types to higher cost houses."

ALABAMA—"With regard to business prospects for 1948, our observations lead to the belief that there should be a continuation of public works and private building well into 1948. There seems to be a continued lack of some materials. This is particularly true in steel and iron products and some other building materials. It is difficult to predict just what the situation will be in the latter part of 1948, but we hope to have a continuation of business as it has been during 1947."

* * * * *

IOWA—"I know it is not nice to be a pessimist, but instead of a boom year in 1948, I believe it would be wise to hint for people to set their own house in order financially.

"So far as production for the highway program is concerned, unless the producers of this material secure a better price than they have for 1947, the less they do the better it will be for them financially in Iowa. I do not refer to the paving contractors in the state but to the rock, sand and gravel people. The State of Iowa advises the contractors the minimum that they must pay the laborers but they permit them to hire individual trucks with their own drivers and pay starvation wages to them.

"You will also recall what a headache everybody had when the agricultural lime program was discontinued this year. We have no assurance but what this will happen in 1948. If it does, what will the answer be? I sincerely hope that the government will have a project.

"I trust that I am wrong in this imagination but if we will tell each other the way we see the picture it will be much better than painting the little red apples on the tree too red."

* * * * *

ILLINOIS—"Many of our plant operating problems remain unsolved because of the inability to obtain new equipment of most every character. However, plant rehabilitation work is progressing fairly well as the manufacturers are delivering quite promptly our requirements of repairs and supplies. There is some indication that the new equipment situation will show some improvement beginning with the 1948 season. There is no specific technical problem that cannot be solved in a normal manner as soon as the manufacturers catch up with the demand and the railroads' supply of equipment increases, particularly open top cars, which will enable them to improve rail transportation.

"The critical car shortage that existed so far this year resulted in a considerable loss of tonnage to both the railroads and ourselves and increased the tonnage that moved by truck from our four plants about 25 per cent.

"Every indication points to a demand in 1948 that will equal or exceed the tonnage we will ship this year. The volume used in private and industrial building will remain about the same in 1948 compared with 1947 but 1948, being an election year, will undoubtedly see a larger volume of tonnage used in public works, particularly highways.

"It is best that we refrain from making the comments we would like to make on national issues but by employing a little patience we are quite confident that the Taft-Hartley Law will improve relations between management, employes, and the union officials."

* * * * *

IOWA—"Our part in construction work is very small in comparison with some operators. We are producing washed sand and gravel for concrete material and doing road graveling and drainage work in this small territory in Iowa.

"During 1947 our work in this territory has about tripled over the year of 1946, and all things point to a much bigger year in 1948. I think labor is getting itself on a more solid footing now than what it was a year ago. At that time it was a pretty jittery looking situation. The equipment situation looks much brighter for 1948 than it did in 1947. Things are gradually coming through a little faster, more equipment being available as time goes on, and I think the manufacturer has done remarkably well, considering labor troubles, shortage of steel, transportation and numerous things they have been faced with during the past year, so summing everything together and looking on the bright side, I think we should all plan and be set for one of the biggest years in the construction game for the coming year of 1948."

* * * * *

IOWA—"In your correspondence with different manufacturers we would be very much interested in knowing if anyone has a good answer on the removal of coal from gravel. We have tried most of the common known ways and would be very much interested in finding a good way to remove coal that is economically possible, in other words some way besides hand picking."

* * * * *

TEXAS—"For 1948, we anticipate building ourselves one new gravel plant to replace one that will have served its usefulness before the last of next year. We will also buy, if we can get delivery, three or four ¾- to 1½-cu. yd. draglines, and probably one or two Diesel-electric locomotives.

"The prospects for business during 1948 are exceedingly bright and we anticipate that the business will be proportioned in approximately the following percentages: Public works, 15 per cent; private building 15 per cent; highways, 30 per cent; industrial building, 30 per cent; residential building, 10 per cent.

"All our plants are located from 40 to 100 miles from our market and we feel that shortage of open top gon-

dola cars will be the principal handicap that will prevent us, and the sand and gravel producers of the country, from taking care of 1948 requirements. It is our opinion that the producers of the country have the capacity but unless the open top gondola car situation is greatly relieved by additional cars that the anticipated requirements will have to be reduced by the availability of cars in which to move this traffic."

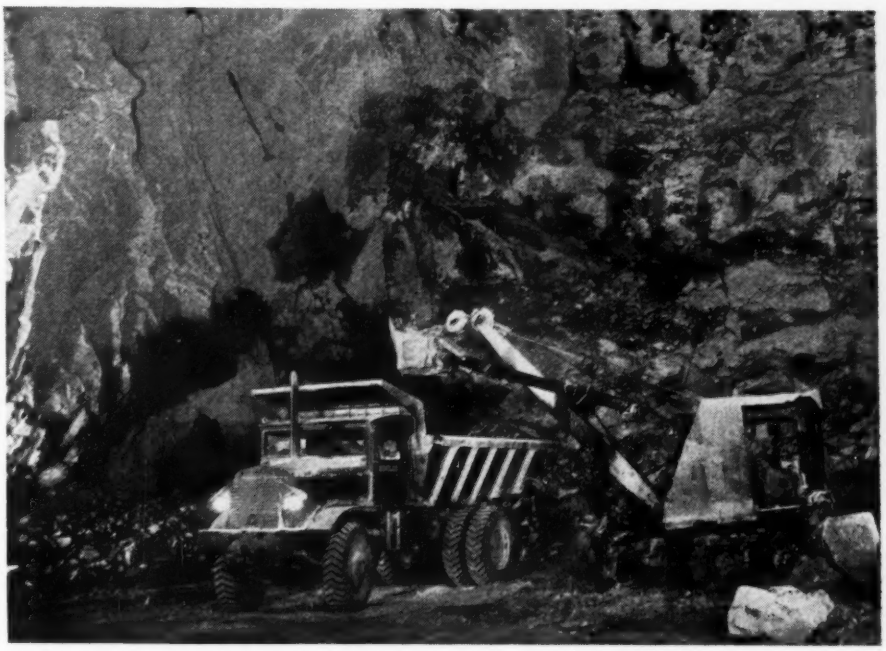
Crushed Stone

PENNSYLVANIA—"Our principal difficulty in 1947 among Pennsylvania producers generally, has been the elimination of flat and elongated particles from our coarse aggregates. There was a time this year, when as many as 15 large plants were temporarily out of production because of too large a percentage of flat and elongated material in the larger sizes of coarse aggregates, beginning with Pennsylvania No. 2B."

* * * * *

MINNESOTA—"We have a high calcium content limestone of good quality for construction work as well as chemical use. Generally speaking, there is a three-way fracture in layers, most of which are less than 12 in. thick and layers of clay separate them. The percentage of clay is not high but it is usually sticky and makes handling a clean product difficult. Some of the best rock can be dug with a shovel without blasting, thus saving expense in drilling and explosives if worked on four levels. A little blasting on two levels may be advantageous. It is cheaper, under our present system, not to shatter the rock more than necessary as we are depending on nature and hand methods to clean the rock to keep a chemical analysis which makes the product sell at a premium. What we need is a screen unit mounted to follow the shovel in the quarry to screen out all dirt possible and convey it back into a truck or leave the waste in 'ricks' to be hauled off later, the rock to be screened into two sizes, one from 3-in. mesh to about 12-in., and the other size over 12-in. Then we can wash the 12-in. minus size when hauled from the quarry screen, and the coarser size will be hauled and handled separately.

"It seems from experience that this quarry screen should have an upper deck built of heavy construction and arranged so the rock will drop and turn over once while cascading down to the truck or lugger box. Then the second deck should be arranged so it could be replaced with coarser or finer mesh of 2-in. to 4-in. depending on how sticky the material happens to be. During a dry period we should be able to quarry and store an adequate supply to last at the plant for possibly a year but with these methods more rock could be taken out any time when the frost was not in the ground.



Loading stone into Diesel-powered truck in the mine

"As to washing equipment, I believe this is not as difficult as pressure nozzles should readily cut clay and dirt from the rock, and our location is suitable for drawing plenty of water from the river, and running the sluice and waste water into a slough below a 20-ft. bank.

"Of course I realize most manufacturers are crowded with orders without attempting any special arrangements, but seeing you requested this type of an inquiry I'm writing you for suggestions."

* * * * *

NEW JERSEY—"This winter we will install a new 2-ft. cone crusher in addition to crushers now in operation. We plan to purchase larger truck units, probably side or rear dump for hauling to the crusher and for loading riprap. Twenty or thirty cubic yard Tournapulls are also on our list to facilitate stripping operations. We are also interested in a satisfactory method of allaying dust around the quarry and a method for making trap rock sand of various gradations. Within the next year, we plan to revamp our storage system. At present our engineers are gathering information and making studies of all types of equipment, etc., anticipating a better than ever year in 1948."

* * * * *

TENNESSEE—"We have operating problems, of course, that will never be solved because we are always trying to improve every phase of the operation. Insofar as I see, there is no radical departure to be made, but efficiency is attained in some measure step by step. Probably the only special study we are making is in regard to a feeder for the primary crusher and whether this should be the regular pan type or the electric vibrator type is still debatable with us, and we are looking into the situation whenever we find time to do so. We think, however, either type should be of the scalping type.

"We plan no new installations during the coming year because we had initiated complete rehabilitation in one plant more than a year ago, and finished it sometime during the middle of 1946. This project included electric shovel, large capacity Diesel trucks, vibrating feeders, etc., and we have been very well satisfied with the expenditure because it enabled us to hold our costs in spite of three wage increases.

"One plant has been further equipped with fine reduction crushers and additional screening. For another plant we have purchased a Diesel shovel with Euclid Diesel truck and other small miscellaneous equipment in order to insure steady and full production.

"We do not have accurate information on business for next year, but I know that we will go into the year with some uncompleted highway contracts and we feel that miscellaneous construction in our territory will be as active next year as it has been during the past year. Our plants are so located that we do not serve industrial and residential building as a primary business with us, but we do ship highway construction, railway ballast, etc., and I would make a rough guess that 75 to 80 per cent of our shipments go for this purpose. We do not anticipate any particular handicaps in operating than those we had during the current year.

"We did not experience any particular labor shortage, but did suffer, like other producers, from a shortage of railroad equipment. It is my opinion that this situation will be improved slightly next year because it

is evident now that manufacture of railroad equipment is greater in numbers than railroad cars are being taken out of service to be scrapped.

"My comments on national issues would not be worth much to you because they might be colored and biased and have pretty much of a sulphurous odor. I do think, however, that all of us should get down to business and arrive at a compromise, if necessary, on the question of wages and prices so that we do not suffer severely from inflation which is a natural result of such conditions. In our own small way we have held our prices down up until now when we made a slight increase in some sizes of our products, but not nearly as high percentage-wise as the things we are buying."

Big Market For Ready Mix and Concrete Products

BOTH the ready-mixed concrete and concrete products industries anticipate capacity production in 1948. Production of concrete masonry units should exceed the billion mark in 8- x 8- x 16-in. equivalent units judging from the 940 million unit figure attained in 1946 and the enthusiastic letters received by the editors from producers. Ready-mixed concrete volume will attain record peacetime proportions.

Chief obstacles to full production and the extension of markets are the availability of cement supply and lightweight aggregates. Availability of lightweight aggregates, now short in supply, undoubtedly would have reflected in the extension of above-grade utilization of concrete masonry units to new highs during a period when competitive materials have all but been priced out of the market. The perlites and other volcanic lightweight aggregates, now being extensively developed and perfected in the Western states, should figure importantly in the future development of concrete masonry markets. Practically untapped is a large potential volume of lightweight ready-mixed concrete.

Typical comments from producers follow:

Ready Mix

PENNSYLVANIA—"At all points, our most serious difficulty seems to be the large number of different types of cement. To meet requirements, we are being obliged to install additional cement bins at our various concrete mixing plants. Indeed quite a number of our mixers already have as many as four different cement bins of 500 bbl. each. All this costs a lot of money, and there is no more money in it for us. Just more trouble.

"So far as the building end of our business is concerned; that is, sand and gravel and concrete, we expect to be plenty busy, and also we expect over 50 per cent of the business to be public work. Ordinarily, we would not like this, but under present conditions if a slump takes place in the private business, then public business will go forward with even more speed."

NEW MEXICO—"We have added a ground storage silo for cement which increases our bulk storage from 500 bbl. to 1800 bbl. We have some tentative plans for a new gravel plant which would include another ready-mix loading plant and involve close to a quarter of a million dollar investment should we go through with these plans.

"For 1948 we could very easily double our volume of concrete if we could double our supply of cement. We are facing a rising volume of business with a shrinking cement supply. The increased freight rates are acting adversely on our cement supply as distant mills do not care to take a further freight penalty when they can sell their output in closer markets. Some mills which used to ship in here refuse to do so unless it is sold f.o.b. through plant, which in our area would increase our cement cost as much as $1.28 per bbl., as of this date, based on figures given us by some dealers who are buying California cement on this basis.

"I anticipate that our chief headaches for 1948 will be cement shortage, black market cement, and car shortages."

Reports from concrete products producers appear in the Concrete Products section.

Miscellaneous

INDUSTRIAL SAND—"During the war years we ran far beyond normal capacity, many plants operating 24-hr. per day and seven days per week. Time was taken out only for absolutely necessary maintenance to avoid breakdowns. We realized that at the end of hostilities that we were going to have plants that have been abused by overwork and we would have to rehabilitate them.

"We also were innocent enough to believe that with the end of war hostilities that equipment would be available on the open market and we could purchase what we wanted. We awoke to the fact that since the war ceased it has been harder to get deliveries of needed equipment than it was during war time.

"The net result is that our program is still one of rebuilding and improving our plants, replacing obsolete equipment with modern installations and adding to plant equipment new devices to improve both the quality and the control of our products. We are aiming to eliminate as far as possible as much manpower as we can, as we have yet to find any surplus of high quality labor available.

"In the industrial sand consumption, we expect continued large volume in 1948 and we, ourselves, foresee no major operating problem with the one exception of car supply. That has been a serious handicap to all industrial sand producers during the current year and the forecast indicates even worse times ahead.

"One definite problem facing all sand producers today is the high cost of equipment. Capital investments made on today's high prices may have to be depreciated some years later on greatly reduced tonnages; resulting in an excessive penalty charge which may be the difference from operating in black to operating in red."

SLATE—"Plant operation problems are labor. Repair parts on old machines are increasingly hard to get, causing suspicion that manufacturers wish to sell new machines slightly changed from the old and made with materials inferior to the old. We cannot get corrugated roofing anywhere unless we accept that dipped in plastic, which is not suitable for our use and, of course, at twice the cost.

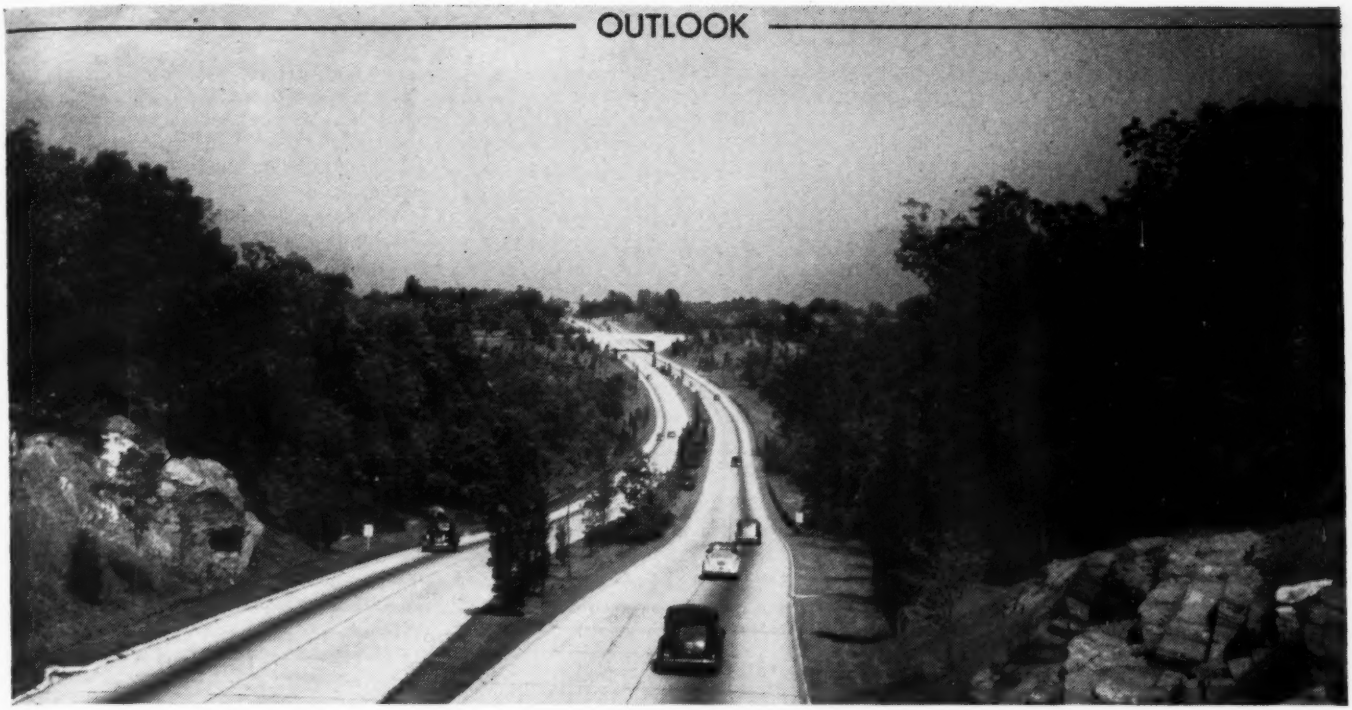
"We need a good deal of heavy equipment but it is hard to find—Diesel shovel, additional crushers and conveyors, etc. We have to get them somewhere but where? New deliveries take too long but can we buy parts and repairs for used equipment or will the models be changed?

"We are operating various types of crushers and on their performance in general in our particular field, we have found that gyratory and roller crushers have been by far the most economical to operate from the point of view of upkeep and repairs, but, of course, will not do the work that hammermills will do. If the abrasion on the hammers on the hammermill could be reduced in some manner or the hammers made to stand the abrasion better it would be of inestimable aid to plants such as ours.

"We figure volume for 1948 should hold up well and that our main headaches will remain the same, namely labor and repair parts."

FELDSPAR—"We of course have been having difficulty, and particularly so during the past six months, in securing replacements for the lighter equipment, i.e., chain, links, buckets, speed reducers, etc., but we do believe that this condition is improving, and possibly by early Spring of next year such equipment should be more plentiful than it is at the present time.

(Continued on page 137)



The Pennsylvania Turnpike, still the nation's number one concrete superhighway, is forerunner of many toll roads and other high speed highways

Big Highway Program In 1948

Chemically-active aggregates are a factor in concrete disintegration in only a few states

CONCRETE as a construction material has been criticized for insufficient durability from so many sources in recent years that the editors have sought the opinions of state highway engineers as to their experience with concrete pavements and their policy with respect to such pavements. Also expressions were sought as to the effect of chemically active aggregates on the durability of concrete, and this article is based on replies received from nearly all states.

According to our returns, state highway departments over the country consider concrete an excellent construction material for pavements. They are convinced, with a few exceptions, that properly-constructed concrete pavements have the necessary durability to warrant their continued construction for heavy traffic load conditions and under all circumstances for which they have been built in the past.

The big majority of state highway departments except in the sparsely settled states and in those where suitable concrete aggregates are unavailable, will continue to specify concrete highways and those few that expressed dissatisfaction with durability will continue to use concrete under those conditions of traffic and loading for which substitute pavements can offer no comparison.

A number of chief engineers of highway departments expressed themselves as entirely pleased with the service attained from concrete pavements, a few in the Northern states were looking for improved pavement life as the result of using air-entrained cements, while three expressed moderate dissatisfaction. One of these engineers said that concrete pavements built in recent years are not as durable as those constructed prior to 1935 while a second was doubtful of attaining desired life of pavement while expressing satisfaction with the durability of concrete highway structures.

In several states, reinforced concrete pavements are constructed wherever traffic counts exceed a minimum number of vehicles, while others invite alternate bids on both rigid and flexible types of pavements and base their selection largely on cost.

One engineer in the West states that concrete pavements are designed for a life expectancy of 25 years and that performance has justified the stipulated life of the pavement. Bituminous concrete is specified entirely in one Southwestern state because available aggregates are unsuited for concrete while a Southeastern state utilizes concrete oniy in the part of the state having suitable aggregates. The existence of adverse subsoils is a factor in the selection of pavement types, in several states, and that consideration will grow in importance in other states as the relation of durability of roads to their supporting base becomes more understood.

Engineers of six state highway departments had experienced disintegration attributed to reactive aggregates, of which four said that low alkali cements are being specified. They anticipate improved results. Only two have observed serious disintegration. Two states are conducting research on the problem including study of the chemical composition of aggregates.

Comments on policy with respect to concrete, the durability of concrete and the effect of chemically-active aggregates follow:

Alabama

"We are at present building concrete pavements where current demands and feasibility and economy of construction make it possible. The proportions of disintegrated concrete, due to reactive aggregates with certain cements, is no greater in Alabama than other states in general, but is quite alarming — much research work is now in progress."

Arizona

"Our 1947-48 budget includes approximately 400 miles of bituminous surface (includes light surface treatment as well as road mix and plant mix), while it only provides for 16.3

Modern express highway in New York State typifies high grade cement pavement and viaduct construction of class needed in many metropolitan areas over the country

miles of concrete pavement. The popularity of the bituminous pavement in this state is due, in large part, to the fact that Arizona has many sand and gravel deposits which are suitable for base material and for bituminous construction, but are not so suitable for use in concrete. Another reason for the popularity of the bituminous surface lies in the fact that the traffic on most of our roads does not justify the greater cost of concrete pavement.

"Concrete pavement has been fairly satisfactory from the standpoint of durability. We use low alkali cement in all concrete construction because of the presence of reactive aggregate in nearly all parts of the state. The policy of using low alkali cement has not been in effect long enough to know whether it will prevent cracking in our concrete work. We have one concrete pavement project, built in 1943, which is showing evidence of deterioration. We believe the deterioration is due to chemically-active aggregate, but there is some evidence to the contrary."

Arkansas

"This department recognizes concrete pavements as a type to be utilized as conditions justify and permit. We have no reason to question the durability of concrete as a product. This department has not experienced any general ill effects through the use of chemically-active aggregates."

California

"It is the present policy of the department to specify a concrete pavement whenever in our opinion the foundation, grade, curvature, traffic, and economic conditions justify this type of construction.

"All of the above factors are studied with relation to each project. There are many locations in the state where the control factors warrant a concrete pavement and it is expected that it will be our policy in the future, as in the past, to specify this type of construction. There is no question about the durability of a properly designed and constructed concrete pavement.

"The relation and effect of chemically-active aggregates on the durability of concrete is pronounced and it is therefore our policy to avoid reactive combinations. This is done through the specification of a low alkali cement whenever we have occasion to suspect the activity of the aggregate."

Colorado

"This department concurs with engineering organizations generally that concrete pavements are exceptionally durable and are especially for use under high traffic volume. This state has not had any adverse experience with chemically-active aggregates. We have had the experience of examining some pavements which were suffering a bad reaction from the use of such materials. Fortunately for us, however, we have not—up to this point—had to use any such materials."

District of Columbia

"The policy of the highway department of the District of Columbia is to construct a rigid type pavement (that is a concrete pavement, or sheet asphalt or asphaltic concrete surface on a concrete base) on all streets carrying heavyweight traffic. The central area or general business area of the city is paved with sheet asphalt surface throughout and any new construction is of the same type. Through routes and pavements constructed in other areas and carrying heavyweight traffic are constructed of reinforced concrete. Also, in general, new residential pavements are constructed of six inch reinforced concrete.

"Practically all aggregate for the manufacture of concrete in the District of Columbia is obtained from the Potomac river and no problem from chemical activity in aggregates has been encountered."

Idaho

"We believe that there can be no question as to the superior durability of concrete pavements. However, since Idaho is a state of relatively low highway traffic and low highway income in proportion to mileage, and also since our subgrade conditions are generally favorable and ample supplies of base aggregates are readily available, we do not feel that the cost of concrete pavement construction can be economically justified except in special conditions. We, therefore, depend mainly on bituminous surfaces on a base of adequate depth.

"In some portions of the state, we have trouble with alkali reactions in our aggregates, and in these areas it is our practice to specify low-alkali cement."

Illinois

"Concrete pavements are constructed when the average daily traffic exceeds 1000 vehicles per day. Illinois has had comparatively little trouble with the durability of concrete. We are fortunate in having a good supply of satisfactory aggregates. We have had pavement failures, but most of them can be traced to conditions other than the durability of the concrete.

"The problem of chemically-active aggregates has caused very little difficulty in this state. To the best of our knowledge, the aggregates which we use in the construction of concrete pavements and structures are not chemically active."

Kansas

"We are of the opinion that the durability of the concrete which we are now building does not compare with the concrete built prior to 1935.

"It is our opinion that there are certain aggregates which are chemically active, which may account for some of the different reactions to strength which we have encountered with constant cement factors."

Kentucky

"The present policy of our department on high type surfacing is to take alternate bids on flexible and rigid types, which probably also answers the latter part of the question relative to durability, in that we consider the two types equal when properly designed.

"We are not in a position to intelligently answer this question (reactive aggregates—Editor) at the present time as our research laboratory is now actively engaged in several extensive research projects relative to concrete aggregate, both stone and gravel, and we do not expect these projects to be complete for several months. The chemical composition of the various types of aggregate has been included as part of the research."

Maryland

"We design the road pavement to meet the loads which our traffic data indicate it will be called upon to carry. In this procedure, we use both rigid and flexible type pavements. Well designed, well constructed concrete pavement on a stable and well drained foundation should have a serviceable life of 25 to 30 years.

"To our knowledge the durability of concrete is not affected by any chemically-active aggregate used in Maryland."

Massachusetts

"This department constructs a limited mileage of cement concrete pavements on some of the major through routes. While we have had some unsatisfactory results in constructing cement concrete pavements with standard portland cement before the war, we have reason to believe that the use of air entraining portland cement will provide the necessary durability. This state has no problem of chemically-active aggregates."

Mississippi

We have no rock quarries in the state.

"Slag aggregate is not permitted.

"Gravel aggregate supply is ample and is specified. Gravel must meet sulfate soundness test, abrasion (L.A.) not to exceed 28 per cent, and other standard general requirements.

"Specifications since 1940 require that cement shall meet autoclave expansion test (0.5 max.) in addition to regular requirements.

"The department awards contracts on concrete pavements where conditions warrant its use.

"In general, concrete pavements in Mississippi are performing satisfactorily, with very little evidence of surface scaling or surface disintegration, etc. Better performance is noted and longer life expected on mileage where soil conditions have been given more consideration.

"We wish to advise that a condition survey of concrete structures and pavements in this state made in June, 1947, revealed no evidence of concrete adversely affected by high-alkali cement-aggregate reaction. Our experience in 'map-cracking' disintegration has been limited to only two projects constructed about 17 years ago. Commercial laboratories handled the materials and tests on these particular projects, and available data are insufficient to try and arrive at any decision as to cause of the particular trouble."

Montana

"I must advise that the Montana Highway Commission has constructed but a very small mileage of concrete pavement since the inception of its construction program in 1917. None has been built for the past eight years, nor is any programmed at this time."

Nebraska

"It is the policy of the Department to construct concrete pavements on certain sections of our highway system where traffic is heavy and subsoil conditions adverse for construction of a less durable type of surfacing. We do not have any specific opinion as to the durability of concrete pavement except that we know that it is the most permanent type of surfacing constructed to date in this state.

"We believe that chemically-active aggregates as well as aggregates of other characteristics, obtained locally and used in concrete pavement construction in this state, have a considerable effect upon the durability of the pavement. In view of this feeling, we are now and have been for several years carrying on a rather comprehensive research project pertaining to this particular item."

Nevada

"This department has not laid any concrete pavement for the past ten years and does not contemplate laying any in the near future; this, however, is for economic reasons, not because of lack of durability.

"We believe that the effect of chemically-active aggregates can be overcome by the use of low alkali cements."

North Carolina

"We use concrete pavement on sections of trunk line highways in areas where it is necessary to ship in material used for constructing the highway.

"The relation of chemically-active aggregates on the durability of concrete pavement has not been very serious in this state up to the present time."

North Dakota

"Under certain conditions concrete pavement is considered to have a definite place in our highway program and therefore is specified for use accordingly. Concrete pavements are designed with a life expectancy of 25 years after which a bituminous resurface can be applied when necessary to restore the pavement to satisfactory condition. The performance history of the limited amount of concrete pavement in this state indicates the foregoing life expectancy is justified.

"While it is fairly well agreed that chemically-active aggregates probably affect the durability of concrete pavement, this has not been a troublesome factor in this state. The available aggregate has been free from this property."

Ohio

"With the introduction of air-entrained concrete, durability of both concrete pavement and concrete structures appears to be increased very considerably.

"We have no chemically-active aggregates of which we are aware and therefore can offer no comment from personal experience."

Oregon

"We usually construct concrete pavement on heavy-traffic roads in the vicinity of cities and on roads which carry heavy traffic over adverse soils. The durability of our concrete roads has been satisfactory.

"None of our concrete pavement has been affected by chemically-active aggregate."

Rhode Island

"It is the policy of the Rhode Island Department of Public Works to build most of the major heavily traveled interstate highways of reinforced cement concrete. Having less than 1 per cent of scaling or disintegration of our concrete highways and being blessed with adequate supplies of good quality aggregate, we are not too much concerned about durability.

"Aggregates used are not chemically-active. However, we do take great care in the manufacture and inspection of all concrete materials. The state is so small that it is possible to have inspectors located at each plant whenever in operation. We feel that adequate inspection is bound to give good results when using materials within specifications."

South Carolina

"The program now underway does not include concrete pavement construction. Tests have not been made in our laboratory for the purpose of determining the effect of chemically-active aggregates on the durability of concrete pavements."

South Dakota

"Concrete is used on highways having 700 or more vehicles per day. Concrete is built as rapidly as the department can afford to do so."

Virginia

"The policy of this department in regard to concrete pavements is that they are constructed principally in the eastern part of the state due to the availability of aggregate. The durability is dependent upon the subgrade upon which they are laid, the design, the manner in which they are constructed, climate, and other variables.

"Fortunately this state has experienced practically no trouble from chemically-active aggregates."

West Virginia

"Concrete pavements are as a rule used by the State of West Virginia on all heavy traffic primary roads, especially where materials for construction are available at a reasonable price.

"West Virginia has had practically no difficulty with chemically-active aggregates affecting the durability of concrete pavements."

Wisconsin

"We intend to continue to construct concrete pavements. However, there are certain design features which have been in vogue in the past which we no longer subscribe to, and have modified our design accordingly. The present design theories do not sufficiently take into account the factors of subgrade conditions and bearing and, if they did, it would be found that for many conditions, substantially thicker pavement sections are necessary if the subgrade conditions are not corrected or modified (refer to Wisconsin in 'Sub-base' article).

"The thickened edge section is no longer conceived to have any structural or economic value. If a given thickness is required in one section of the slab, it is also necessary throughout its entire width. Expansion joints are unnecessary in pavements, except to provide insulation of other vertical structures protruding up through the pavement. Load transfer devices or dowel bars are not only useless but, in some cases, have proven to be actually detrimental and a cause for serious pavement breakage.

"Transverse dummy joints at intervals of 15 to 20 feet are necessary to provide shorter and consequently stiffer slabs whereby to inhibit to a degree the subsequent random cracking of wider spaced joints, rather than that they are introduced to inhibit or control temperature or so-called warping stresses. High inherent strength in flexure or compression is not conceived to be necessary in concrete for pavements. The strength, or rather resistance to bending of the slab, must be attained by greater thicknesses. The inherent strength of the concrete itself need only be sufficient to withstand weathering.

"The integrity or durability of a concrete pavement built of sound materials is contingent upon the proper relation between thickness of the slab and subgrade soil conditions rather than upon other factors.

"We have no experience with so-called chemically-active aggregates except if the disintegration following so-called D cracking can be considered along this line. While this is quite extensive in some pavements built of dolomitic or calcareous aggregates, it is also quite definitely associated with the soil conditions because this type of cracking and subsequent disintegration has not been found on pavements built of these aggregates except only where these pavements also lie upon soils of the calcareous glacial drift or a derivation thereof. Loads also appear to be a factor since, on some of the roads carrying lighter traffic, this has not been a serious factor, even though the aggregates and soils are comparable to those where it has taken place extensively on the heavier traveled roads.

"Aggregates containing considerable chert have caused pop-outs to a substantial degree but, other than being unsightly, have not contributed to the failure of the pavements as a whole. One pavement built of igneous type aggregate has failed by disintegration. This was probably due to a coating of foreign material, perhaps iron ore, surrounding the aggregates which was not removed by washing."

Wyoming

"Except for a few hundred feet constructed through tunnels no concrete pavement has been built in this state since 1934. No pavement of this type is anticipated in the near future.

"Disintegration has occurred on a number of structures in this state some of which has been attributed to chemically-active aggregates. As a result we specify low alkali cement for all concrete work."

(East) Anonymous

"Our present policy in regard to concrete pavements is to use them only on our heavier traveled highways. Practically all of our construction at present is on secondary highways; therefore, we are building very little concrete. The durability of concrete in this climate for pavements appears to be doubtful. Structures are O.K.

"Our pavements started scaling between the time we started plowing snow and the beginning of the use of chemicals in sand."

(Southwest) Anonymous

"We have no administrative policy in regard to concrete pavement since this is a matter of economic and engineering analysis which is too complicated to set up as a policy. Also, there can be no single opinion concerning the durability of concrete pavement since the durability depends largely on the design and construction conditions and as to whether the concrete is used as it should be used.

"We have not had sufficient apparent trouble from chemically-active aggregates to say that it is a serious matter in this state."

(East) Anonymous

"In constructing concrete pavement, we are at present calling for the admixture of an air-entraining agent in an attempt to produce a more durable concrete. The 'opinions' we have as to the causes of the lack of durability in concrete are numerous but the most favored is the poor quality or the varying quality of the cement itself. We believe that the desire to obtain a high-early strength cement by fine grinding coupled with improper burning has resulted in a cement that results in a porous concrete, which lends itself to disintegration very readily. The increased use of vibration and the improper use of vibration have further complicated the concrete mix, fostering a desire to place a mix with insufficient mortar, and depending upon the vibration to produce a 'workable' mix. The increased and promiscuous use of salt has also accelerated the disintegration of concrete pavement."

(Midwest) Anonymous

"In general it is our policy to construct concrete pavements on the state highway system where the volume of traffic and subgrade problems indicate the desirability of this type of pavement. It is our observation that concrete pavements 25 or more years old should be resurfaced in order to pro-

Clover-leaf grade separation effectively using concrete for highway safety in Bergen county, N. J. Much similar construction is needed

vide a smooth riding surface. While most of our concrete pavements less than 20 years old are still in good shape, it is probable that we should plan to resurface all concrete pavements before they are 30 years old. In many cases the resurfacing should include pavement widening.

"No serious difficulty has been experienced due to the effect of chemically-active aggregates on the durability of concrete pavement. We believe, however, that it is desirable to use air-entraining cement to overcome the relatively small amount of scaling which we have experienced."

SUB-BASES For Highways

SUB-BASES for highways are being given widespread attention in design, as an important factor to prolonging pavement life, and it is now recognized that many premature failures have been due to faulty road foundations and not to faulty cement or aggregates. Drainage of water away from pavements is now being recognized as essential and the degree to which drainage must be provided is dependent, of course, upon the character of the soil at the level upon which a pavement rests. Pumping at joints is known to occur where concrete is laid on relatively impervious soil subgrades, which ultimately leads to failure of pavement due to lack of a sustaining foundation that follows as a result of the pumping action.

Early pavements, laid on mud soil without provision for sub-drainage very likely disintegrated as a result of lack of knowledge at the time they were built and it is becoming increasingly recognized that construction of granular sub-bases and other provisions for subsurface drainage may be the most important consideration in building roads to endure. First costs of construction where sub-bases are provided are higher per mile of road paved but longer life, as a result, may more than offset the cost.

The editors asked state highway engineers to state their preferences in sub-bases, whether it be for compact, impervious types or loose, drainable types and this summary is based upon replies from most state highway engineers.

It is of interest that about half of our replies indicated preference for loose, granular sub-bases and that half as many states prefer dense, impervious types. Several states which are leaders in building high-type roads are specifying a compromise of compacted sub-bases that are not impervious. Replies were as follows:

Alabama

"We, in Alabama are not troubled by frost action, hence, we favor dense and firm subgrades or specially prepared padding courses of low plasticity, with free draining shoulders, for concrete pavements."

Arizona

"We use only well drained bases under all types of pavement extending the base for the full width of the road, including shoulders, so that no water is trapped in the base material. When necessary, a prime coat is specified to bind the base.

"Our specifications covering base material are very loose, except in respect to plasticity index and per cent passing the 200-mesh sieve. We specify a maximum plasticity index of 5 and a maximum passing a 200-mesh sieve of 15 per cent. No abrasion test is required on base material. Grading limits are specified in the construction special provisions to fit the materials economically available to the project. All available sources of aggregates are thoroughly prospected, sampled and tested in advance of the project design. Sources of all aggregates, except concrete aggregates, are designated in the construction special provisions."

Arkansas

"As economics of design and construction might permit, we would prefer sub-base susceptible to drainage but not necessarily loose in the sense that it fails to compact or that the particles fail to retain their place in the mass."

California

"We strive for compacted, impervious sub-bases under portland cement concrete pavements because we have reason to believe that there is a definite advantage of such a sub-base as a means of minimizing movement of the pavement slab, mud pumping, and the development of offsets or 'step-offs' at joints.

"We have had a heavy highway testing program since the end of the war, made possible by the inability to put to use during the war years construction funds which accumulated during that period."

Colorado

"We prefer compacted, impervious sub-bases, which must also have the characteristic of remaining stable in the presence of water. We have found that porous sub-bases have the characteristic of allowing intrusion by silt-clay materials, and when such intrusion progresses sufficiently, the entire sub-base becomes 'quakey' and loses stability."

Connecticut

"We prefer a compacted, granular, drainable sub-base and specify a broken rock, crushed stone (100 per cent passing a 5-in. square opening and at least 75 per cent retained on a ½-in. sieve) or gravel (100 per cent passing 5-in.; 30-65 per cent passing ¼-in.; 5-30 per cent passing No. 40; and 0-10 per cent passing No. 200)."

District of Columbia

"The highway department of the District of Columbia specifies a dense, granular type of material, compacted to a density as specified by A.A.S.H.O., and having a plasticity index of less than six for sub-bases (but not non-plastic). It is believed a compacted impervious sub-base is a greater assurance of maximum sub-base support and greater assurance of a permanent sub-base. There is ample material meeting the specifications of the District of Columbia to make this practice economical.

"The fact that all utilities are placed underground and within the highway right-of-way for the largest part of the District of Columbia and therefore the foundations for pavements are made up of many backfilled ditches, makes the problem of constructing a durable and strong sub-base of the greatest importance. Soils materials within the District of Columbia are variant and range from heavy clays to granular material and therefore specifications must provide against capillarity of soil as well as drainage.

"A compacted and dense sub-base provides structural strength which tends to bridge across utility ditches while a loose drainable type of sub-base would provide little if any support under such conditions. It is believed vibration from traffic would soon cause the fine material of the subgrade to percolate through the loose granular material reducing the bearing power of the sub-base and destroying its ability to act as a drain. It is believed provision for necessary drainage is better placed outside the paved area rather than under it.

"The highway department of the District of Columbia has not encountered any pumping at joints with this method of sub-base construction though subgrades consist of a wide variation in soils."

Idaho

"Our practice is to specify a well compacted granular sub-base for concrete, rather than an impervious type."

Illinois

"In this state we use compacted sub-bases. However, due to the fact that they are constructed of granular material, and even though the specifications require a large percentage of material passing the No. 4 sieve, I would not say that the sub-bases are impervious. We require the sub-base

(Continued on page 138)

Looking At the Industry

Through 26,000 Miles of Travel

Some very practical observations by one of the editors of ROCK PRODUCTS on conditions found in 26 states during the past year

By W. B. LENHART

THIS ARTICLE is a bird's eye view of the rock products industries of the United States, visited by the writer in 48 continuous weeks of travel, during which time 26 states were visited, representing slightly in excess of 26,000 miles of car mileage. In going through such a wide area one cannot help but be impressed with the interrelations of one branch of our industry with another. Thus, if the portland cement manufacturers are all working at capacity or near capacity, we automatically know that the aggregate producers are swamped with orders. Or if one concentrates on the lime or gypsum industries and finds them expanding greatly because of the excessive demands, we can say with a high degree of assurance that the cement producers, or the aggregate producers are following a similar trend. The concrete products industry can also be used as the gauge with which to measure the activity of the other rock industries.

When one is in the West he is constantly asked as to how conditions are in the East. And when in the East they ask how the Westerners are doing. We can only answer that question by saying that business is excellent throughout the areas covered. Prices have gone up slightly, but not enough to account for a fraction of the total rise in construction costs and that new plants have been built, are under construction, or are on the drawing boards to meet the great demand for basic building materials needed for at least another five years. Older plants in all branches of our industry are constantly being changed, enlarged, or modernized to a degree that is not only surprising but is not easily apparent on the surface. For instance, one of the older and larger aggregate producers with large plants throughout the East, in a very offhand manner, said that during the past year or so they had not done a great deal of changing, except that all operations (except one) had gone over to truck haulage, several new shovels had been purchased, some new type crushing equipment had been added and all their operations now had black top plants. When one sits down and adds up the dollar cost of these items it runs into surprisingly large figures. What we are trying to point out here is that this company official thought it a very minor item. When one couples these "minor items" with the major ones, and the new plants completed, under construction, and proposed we can truly say that the rock industries today are Big Business.

Perini & Sons, Inc., operating Cedarapids plant on Maine Turnpike job. Diesel supplies power

On the Pacific Coast and in the Rocky Mountain states, as one travels through these areas he cannot help but be impressed with the large amount of construction work he actually sees. New buildings, roads, bridges, huge housing programs all are visible to the eye as the territory is traversed. But in going through the New England and Eastern States, for some reason or another the opposite could almost be said to be true. One does not actually see so much construction activity, but when the cement producing sections are visited, none of the manufacturers has any cement. The storage silos are empty yet the plants are running to capacity. Making such an extended trip as this, one can only wonder where all the material goes. These observations were checked with talks with concrete products manufacturers, and in most cases they had no cement on hand and they were on a hand-to-mouth basis. The probable answer to this conditional shortage is that with the large population along the Atlantic Coast and with a vast net-work of highways (Pennsylvania alone has 42,000 miles of highway) only a little construction work, here and there, along *each* few miles of highway adds up to a total that has the producers about swamped. Whereas in California, for instance—a long state that really has only three major highways running the length of most of the state, one can drive up on one highway and return by another, and, with building being concentrated more or less along these major highways one can get the impression that the West is moving faster than the East in construction lines. But it's this writer's studied opinion that the West has more construction per capita than the East but the sum total of construction in the East is very great and in most sections producers had all the business they could handle.

Portables for Maine Turnpike

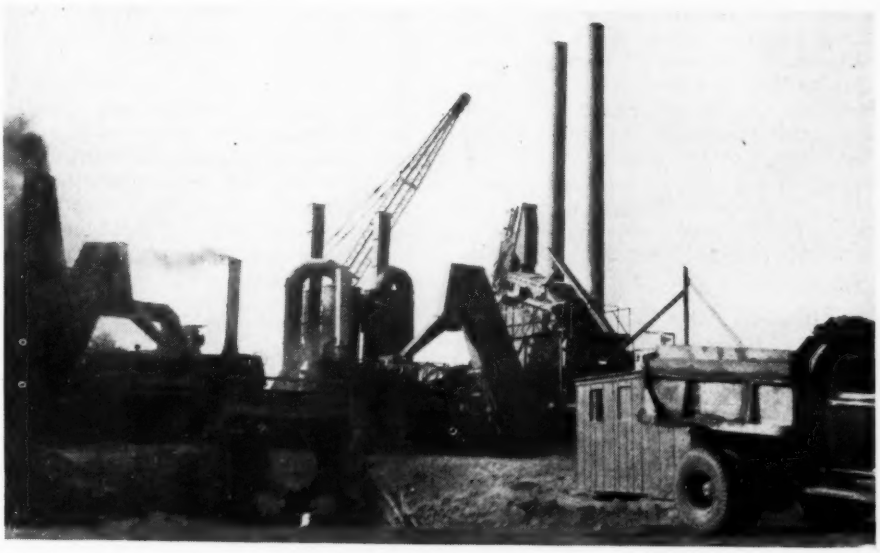
As an illustration, the State of Maine went into high gear on the construction of the Maine Turnpike

that involved the placing of 644,000 tons of bituminous road material, which, incidentally is the largest single such placing job let to date. This 45-mile segment of a planned, statewide, super-highway is expected to be in service by the turn of this year. In its construction, portable gravel and crushed stone plants—all with their bituminous associated plants, came into the area from the outside—one from as far as Kingman, Ariz., but not in a single instance could we find any resentment by local operators because the established producers all had more commercial business than they could handle. They could not have supplied the vast tonnages required even if they got the business. And yet as one skims through the area not related to the major highways he must wonder where all the aggregates are going.

When one visits the older, established aggregate producers in this most northeasterly area and compares their plant productivity with that of the portable plants — weighing the operations strictly on an engineering basis and concepts of efficiency, one is compelled to admit that the portables have the edge. The Maine Turnpike had four portable installations, each turning out around 200 tons per hour. (Three gravel and crushed gravel, and one crushed stone.) The four plants produced a flood of material at the point of use, with crews of surprisingly small numbers. Their efficiency is something that all aggregate producers could well think about for a trend could be set up similar to practices as in one of our Northwestern States. Here the state highway department has "certified" a large number of deposits scattered over the entire state. Such deposits are capable of producing suitable aggregate to meet the state's specifications. When a large construction job comes up, the older and established producers with non-portable plants in the larger communal areas simply move one of their portables to the closest (or most economical "certified" pit) and produces stone there until the job is done, after which the portable equipment is moved back to the home base.

More Western Activity

If the trend of this article accents the West it is because in that area the most spectacular changes are going ahead. The immediate impact of these changes on our industry is great, and the future, over a long period of years, should see no lessening, for in the West three distinct but inter-related empires are in the making. The most spectacular of these, of course, is in Southern California with Los Angeles as the hub. The extreme growths there are too well covered by the press and radio to dwell on here at much length, and the only visible limits to this growth goes back to water and water supplies. But when one sees what the hardy Mormons through the State of Utah and contiguous areas have accomplished by irrigation and water conservation and carried it out with pitiful resources, one need not be alarmed about future water shortages in California.



One of several "hot top" plants on the Maine Turnpike

Water for Southern California is coming from two main sources, the Bishop and Inyo County sources, and from the Colorado river sources. But for the state as a whole the water resources, with proper conservation, are enormous. One program started before the war but now again being pressed to completion is the Central Valley project. A huge area of northern California has an annual rainfall probably as high as any section in the United States of similar area. The writer lived there one winter when almost 100 in. of rain fell in one year, and 20 in. fell in 24 hours. The Shasta Dam is retaining those floods and releasing the waters as needed for power and irrigation purposes. Further to the south the Friant dam on the San Joaquin river controls the flood waters that arise each spring from the melting of huge snow blankets in the vast, high Sierra Nevada country. The easterner can have little conception of these great snow falls, but here again the writer spent a winter and personally recorded a total of 484 in. of new snow between January 1st and June 1st. These melting snows eventually flow to the Friant dam. Feeder canals are being completed now to carry the waters both in a north and southerly direction—to the Bakersfield area. Again we can go into the Imperial and Coachilla valley of southern California where huge canals are still being built to carry Colorado river waters to the northern end of this great valley or chain of valleys. New irrigation water will be soon flowing onto desert land very close to that same Palm Springs, Calif., visited early this year by the sand and gravel and ready mixed concrete association members. Or again we can point out the greater distribution of water through ducts and canals of the Metropolitan Water District. New large diameter concrete pipe installations are now just being completed to get water into the San Diego areas. While these waters will not necessarily be used for irrigation purposes, said waters will and do raise the level of the ground water tables in the area, so that many of the Coastal cities, (such as Long Beach which now, as formerly, gets its water from wells) will have a smaller pumping job to do. This traveller can see no immediate limits to the empire being established in Southern California.

The second empire in the making is that one relating to the future development of the Colorado river. This huge project will not cost the tax payer a red cent. All funds supplied by the Federal Government will be repaid by those who benefit from the development. The program calls for the ultimate spending of some $3,800,000,000 over a long period of years. There will eventually be some 15 great dams similar to Boulder dam, with huge electric power projects. A large amount of this electrical energy will be used to pump water onto the deserts of Arizona, Nevada, etc. Some $650,000,000 will be spent on area contiguous to Arizona alone, and will eventually supply subsistence to millions of people. No, don't sell Arizona and the areas around Phoenix and Tucson short, for here will be a vast empire with its unmatched climate for salubrious living.

The third empire in the making is that referred to locally now as the "Inland Empire" and stems from the Grand Coulee dam in eastern Washington. This project, started before the war as a power and irrigation

development by the Department of the Interior, is again going ahead to completion. Streams of water in sizes that stagger the imagination are destined soon to be pumped from water-developed electrical energy into the fertile soils of the area. The individual sections making up this project are so vast and so diversified that we can only mention the project as a whole, but today they are becoming real.

Building New Cement and Gypsum Plants

As an indication of the awareness of our industry of the future growth in the West, we can cite the proposed construction of a new portland cement plant near Albuquerque, N. Mex.; also one near Tucson, Ariz., and the new plants at Devil's Slide, Utah, and at Portland, Colo., and what amounts to practically a new plant at Oswego, Ore.

In the gypsum processing field, new plants (including wallboard) include two proposed plants near Sigurd, Utah, and the enlargement of facilities at Plaster City, Calif., as well as the recently completed wallboard plant at Long Beach, Calif. One large Eastern producer is also expected to enter the Western gypsum picture very shortly.

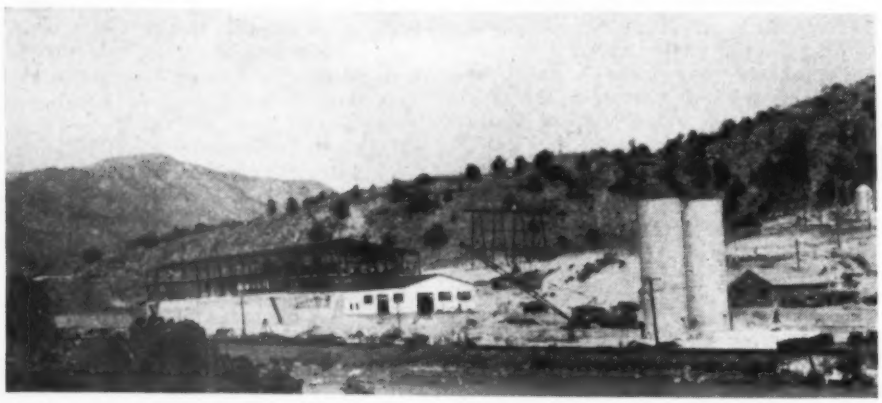
Sand and Gravel—Concrete Block and Ready Mix

Many sand and gravel plants have been built in the West or are being built, such as the plants at Azusa, Bakersfield, Tracy, and Elliott, Calif; all ultra-modern plants of large capacity and of designs that are setting new trends in their particular fields. In Portland, Ore., and throughout the West and Southwest, growth in our industry could be used as illustrations of the fact that those areas too are taking their place in the big picture comprising the rock products industries.

In the concrete products field, in Southern California alone during 1946 and 1947 there were reported in excess of 500 new plants. Many of these were small, but on the other hand, some of the new and larger concrete block plants far outdistanced any seen in the East or Middle West on this trip. When we say "outdistanced" we mean the new Western plants are not only of great capacity but are of impressive design with 12 to 15 acres of paved ground around the plants, neatly fenced, landscaped and with ultra-modernistic offices all blending to give the industry the appearance of stability, reliability, and soundness so that one seeing these plants gets the impression that here is a basic industry that can deliver a superior product and has the resources to supply an unlimited demand. It indicates a trend, especially true in the West, that the concrete products industry is drifting into strong hands.

One is particularly impressed with the advanced development of ready mixed concrete in the West as compared to other sections traversed. Sand and gravel producers in the West usually have batching facilities and mixer truck equipment. Western manufacturers of batching equipment are particularly on their toes and are supplying large and smaller communities with automatic batching equipment of ultra-modern design and in some cases are using electronic controls on the scales. These are, in some cases, pre-fabricated units that can be hauled to the site of use where, after placing by a suitable crane and the proper electrical connections are made, a ready mixed concrete business has been started. It is not at all unusual to find a batching plant with a fleet of trucks in isolated communities of surprisingly small population. Some of these ready mixed concrete producers also use advanced selling methods. Deliveries of concrete up to 65 miles or more are made, and this particular operator probably sets a record of some kind or another on the yearly road mileage piled up by the mixer truck equipment.

Even in the industrial minerals division progress can be reported as exemplified by the new feldspar plant at Parkdale, Colo. This new, large-capacity plant, using flotation as part of the beneficiation processing, represents a large investment. It is of advanced design and of steel and reinforced concrete construction.



Modern plant of Consolidated Feldspar Corporation at Parkdale, Colo. Two of the 10 silos to the left will hold finished material

More Producers Are Contracting

A very apparent trend, perhaps more noticeable in the East, is the blending of the crushed aggregate operations so as to include production of bituminous road material and, on the other side is the old black top producer and contractor blossoming out as an aggregate producer. One old time rock producer in New Jersey, for instance, not only has a black top plant at one of his quarries but takes contracts to place the bituminous material, and, in New Hampshire an old time road contractor and black top operator has built one of the largest and most modern commercial crushed stone plants in the New England States. Trends like these may indicate that at some future date, the contracting field and the commercial aggregate producer may become one and the same. Again, going back to New Jersey, a quarry operator there has a ready mixed concrete plant near his crushed stone operation and this plant is delivering air-entrained concrete for a standard width highway where a single concrete slab will be poured that is one mile long—with no expansion joints. This experimental slab is expected to stand the rigors of winter and summer heat due to the use of air-entrained material. This also may indicate a trend well worth watching.

Big Highway Programs

The financing of highways in any one particular state seems to find a similar problem in practically all the states visited. Super highways, express-ways and means of speeding up traffic in the larger communities is the theme whether it be in the East, the West or in the Mid-West. The proposed expenditures that will extend over several years runs into the billions of dollars with a far greater proportion of the money spent to be in the cities or their suburbs. Pennsylvania, Illinois, and California, for instance, will spend huge sums to construct relatively short lengthed highways in an effort to solve the serious traffic jangles in their major cities.

Ohio, Oklahoma, Connecticut, Arkansas, West Virginia, Georgia, Maryland, Pennsylvania, Washington, New Hampshire, Maine, and California—to name a few, are states which have super-highway programs, passed, in process of passing, or being considered in which toll or some phase of toll taxation will be the basis for financing all or a part of the issues.

Trends in Calcining

In the cement and lime industries we noted the tendency for longer and longer rotary kilns and for the inclusion or addition of dust collectors of the electrical precipitator type. These industries are becoming very dust conscious and several large producers in the East have just installed, or are

installing electrical precipitators to once and for all eliminate the dust question. Long kilns in the wet cement plants are becoming no novelty but one company in the West has plans afoot for a kiln in the 400 foot range using the dry process and will stockpile blend the raw mix prior to grinding.

In the gypsum industry the newest and largest calcining plant built in the East uses a battery of 16-ton capacity kettles grinding the rock in roller-type mills with tube mills for re-grinding the calcined stucco for all of the sacked trade. New wallboard plants follow more or less a common pattern with, however, considerable differences in details of construction. Similarly, the drying of wallboard seems to have become standardized.

Some new and radical developments are in process relating to all calcining operations that may have a profound effect upon the lime industry, or any calcining industry where the calcined material does not fuse or clinker. It may even apply to the cement industry. Considerable secrecy surrounds this new and novel development but ROCK PRODUCTS has obtained the pertinent information, which is now released for publication in this issue.

Quarry Developments

In quarry operations we did not run into any use of the lance-flame method of drilling rock. Nor did we find any quarry using the rotary drill method for drilling long primary blast holes. Several mines, however, have been using either the so-called "fish-tail" type of rotary bit or the conventional diamond drill for punching long holes for blasting purposes. We did note a decided trend in quarry operations towards a greater use of wagon drills with quarrying being carried on in shallower benches, particularly was this true in cement quarry operations where not only rock was wanted but a certain chemical grade was necessary. Lower faces with more places to work lends itself to this type of quarrying and rock blending.

There appears to be a very decided trend in quarry operations and in the crushed "rock" plants of the Far West to have the primary crusher located at the bottom of the pit with an intermediate stockpile or surge pile between the first crusher and the rest of the plant. Most plants, in these cases, used a series of long belt conveyors to a high degree for all primary and secondary conveying. However, one extremely successful and large crushed gravel plant in southern California was using belts for the conveyance to the main plant, but with large capacity bucket elevators of unusual design for the balance of the plant. Another large new plant in California had the operation divided up into five separate units that could be operated as a whole, or any one unit section operated independent of the rest. To do this called into play what was essentially three different surge piles. Where crushed gravel is a feature of the operation there is more and more a tendency to keep the two products separate and to process them in separate washing plants. There is also a movement for taking out a dry sand either at the scalper or soon thereafter as the concrete block manufacturer, or the ready mix operator is finding that a dry sand has many advantages when slump considerations are important.

The rod mill in several instances in the West is being used for the preparation of sand, especially from pea gravels which are in excess in many cases. This writer has contended for years that the rod mill is an overlooked grinding tool, and for reducing 2½-in. rock to 48-mesh or thereabouts, we think it will grind more rock per horsepower than any other type of mill. Cement manufacturers can well study the performances of these mills for preliminary grinding purposes. However, at one operation in the West, a ball mill was reported to be going on the line to produce sand.

Sink-Float Process

The sink-float or heavy media process for concentration of some ores has found a continued use in the industrial minerals section of our industry. This process which is radical at first glance but could well find a use in the sand and gravel industry to remove water-logged wood chips, clay balls, coal, etc. It was said, that on the basis of a plant handling 100 tons per hour, that the costs would be in the 6 to 7¢ per ton range (total) and that such a plant would represent an investment for equipment alone of about $45,000. This process is bound to take hold of the sand and gravel industry in certain sections, and we know already where the U. S. Army Engineers in charge of the construction phases of the Missouri river flood control program have used this process, in an experimental manner, so as to get a suitable aggregate. In this case, it was said, they were removing manganese bearing rocks of a soft texture from the main aggregates.

Precast concrete piling of large dimensions at New Jersey plant

Secondary crushing plant of John Iofolla Crushed Stone Products Co., Portsmouth, N. H., Final screening section over bins in background

Two rather new concentrating processes for sand have come into the picture very recently. When we say "concentrating" we have in mind methods for removing lightweight materials (such as coal) from sands, or the removal of excess slimes, etc. One process is a modification of the sink-float (or Heavy Media) process and was developed by Dutch inventors. The second process uses a stationary spiral-type concentrator that takes up a very small amount of floor space and has no moving parts. Its simplicity, low operating cost and performance may find many uses for it in our industries.

Big Future for Concrete Products

In travelling through the Northwest sections of the United States, it is apparent that our timber resources are going at a fast rate, regardless of all the propaganda to the contrary. These are facts that the concrete products and aggregate producers can well keep in mind for it won't be many years before we will be compelled to use concrete and concrete products to a far greater degree. In Europe, for example, where steel and wood are nil, standard gauge box cars are being made of concrete. Brake blocks for these same cars are also being made from concrete. Flexible boards are being cast of concrete. These and many more products will come into the picture with the disappearance of our forests.

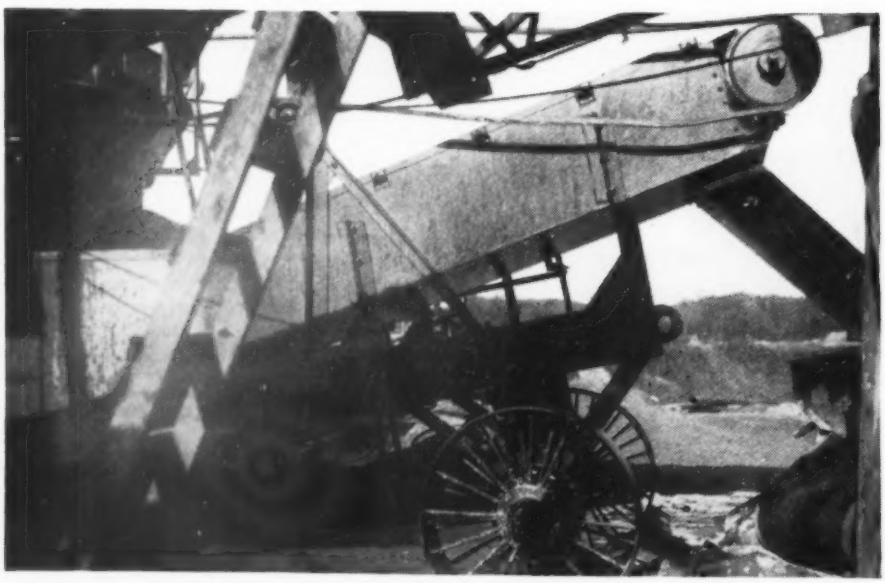
Lightweight aggregates throughout the United States occupy a great amount of inventive attention. In the Far West and Southwest, pumice and volcanic clinker occupy the limelight. Expanded clays of various kinds are competing with these natural products. In one Northwestern state a cement manufacturer stated that over 15 per cent of his company's sales were to concrete products plants and that practically all these plants pro-

(Continued on page 141)

PORTABLE Equipment Converted to Permanent Plant Set-Up

Over-all view of plant. Conveyor from primary crusher supplies plant, left center. Final sizing is completed at extreme left. Conveyors to the right move sized aggregates to bins over reclaiming belt conveyor

Rotary screen and scrubber for preliminary sizing and washing



Sand is reclaimed in screw washer. Note wheels for portability

AN UNUSUAL SET-UP of conveyors, screens, and crushing equipment has been installed by Becker County Sand and Gravel Co. at a deposit near Marion, N. C. Placed in operation in October, 1946, the equipment consists primarily of portable units which, however, have been set up as a permanent plant. With few exceptions, all plant machinery is of Pioneer manufacture.

The deposit averages about 20 ft. in thickness with 5-ft. overburden, and consists of about 80 per cent gravel, very little of boulder size. Overburden is stripped and trucks are loaded with a Manitowoc dragline with a 1¾-cu. yd. bucket on a 50-ft. boom. Haulage from pit to plant is handled by a fleet of five 8-cu. yd. bottom-discharge Euclid trucks.

Succession of Screen and Crushing Stations

Trucks discharge from a ramp into a 15-cu. yd. steel hopper equipped with a grizzly feeder with 2½-in. spacings. Minus 2½-in. product, received in a 6-cu. yd. hopper with a reciprocating feeder, discharges to a 30-in. belt conveyor, 68 ft. centers. Plus 2½-in. gravel is reduced in a 30- x 42-in. jaw crusher, the crusher throughs joining the minus 2½-in. product on the belt conveyor. This conveyor discharges through a transfer station to another 30-in. belt conveyor, 45 ft. centers, feeding a 4- x 12-ft. triple-deck screen at the first processing station, a portable unit in itself, although it is connected by conveyor to another unit for more extensive processing of material.

The triple-deck screen, equipped with 2¼-, 1½-, and ¾-in. square openings on the three decks, respectively, discharges the products retained on the two upper decks into a 20- x 54-in. roll crusher for reduction. Throughs from this crusher and the minus ¾-in. from the screen are conveyed to the next station for further processing. The material retained on the lower deck (plus ¾-in. and minus 1½-in.) is elevated to a discharge point above storage bins by a 24-in. belt conveyor, 65 ft. centers. This

Becker County Sand and Gravel Co., Marion, N. C., uses a number of conveyors to tie in the various portable plant units. Products meet all state highway specifications

product is North Carolina specification 6S, a secondary road surfacing aggregate.

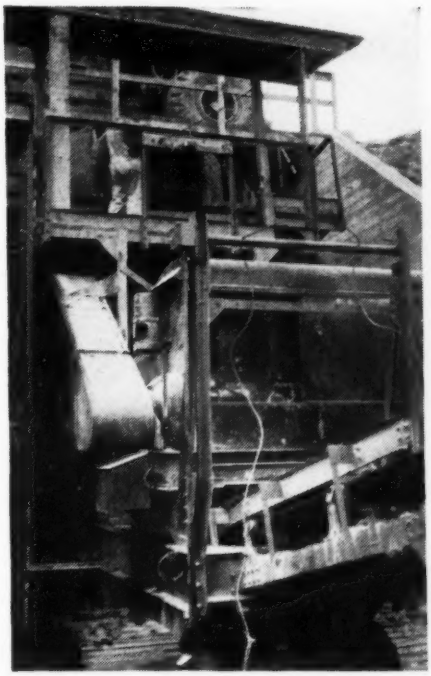
The material conveyed to the second station by a 30-in. belt conveyor, 50 ft. centers, discharges into a 4- x 16-ft. rotary scrubber equipped with a blank jacket for 12 ft. of its length, surrounding a rotary screen with 1-in. square openings. Plus 1-in. material, reduced in a 20- x 42-in. smooth roll crusher, returns in closed circuit to the scrubber by two 30-in. belt conveyors, 25 and 50 ft. centers, respectively.

The product passing the rotary screen (minus 1-in.) is rescreened on a 57-in. x 16-ft. double-deck horizontal screen with ⅝- and ⅛- x ¼-in. openings on the two decks, respectively. Plus ⅝-in. gravel is elevated to storage bin by a 24-in. belt conveyor, 60 ft. centers, as concrete aggregate. At the discharge end of this conveyor, above the bin, is a 4- x 8-ft. single-deck Bonded Scale Co. screen with 13/16-in. square openings, over which the conveyor discharges when a special mat stone is to be produced. This stone, North Carolina No. 10, is the product retained on the screen, while the minus 13/16-in. gravel is a concrete aggregate for commercial users. The latter product can also be blended back to the bin containing the 6S gravel.

Sand Processing

Retained on the lower deck, a minus ⅝- and plus ⅛-in. product, is conveyed to bins as North Carolina specification 11A, a retreatment aggregate used by state highway maintenance forces. Sand passing the lower deck and processed in a 22-in. x 18-ft. Eagle Iron Works twin screw washer, discharges to a 30-in. belt conveyor, 50 ft. centers, for delivery to a stockpile. Overflow from the washer is flumed to waste.

Five open bins, with 150-cu. yd. capacity each, comprising stockpiles with wooden partitions to separate the several types of aggregate, are above a concrete recovery tunnel housing a 36-in. belt conveyor, 185 ft. centers. Aggregates drawn from the bins to the conveyor through drawoff chutes are delivered to a transfer station equipped with a 4- x 8-ft. Jigger rinsing screen with ⅛-in. square openings. Crusher run material by-passes this screen, while other products are washed over the screen prior to delivery to a loading tipple on a 36-in. belt conveyor, 85 ft. centers.



Primary crushing station where plus 2½-in. gravel is crushed

B. F. Smith, master mechanic, center; H. W. Hasskamp, assistant superintendent; J. K. Stanley, office manager

Washing water is provided by two 6-in. Jaeger pumps that deliver 1500 g.p.m. to the vibrating screen in the second station, the scrubber, and the rinsing screen. The scrubber is equipped with a 5-in. spray pipe located in the center, that gives the product a washing as it is agitated.

Production capacity is about 150 tons per hour, varying necessarily with the type of material produced.

M. C. Evans is superintendent of the Marion plant. H. W. Hasskemp is assistant superintendent; J. K. Stanley is office manager; and B. F. Smith is master mechanic.

Lake Sand Removal

METROPOLITAN ACTION COMMITTEE, Cleveland, Ohio, recently launched a campaign to halt sand dredging operations in Lake Erie.

Output of Building Materials Lags

DESPITE A SHARP rise in production in August, output of several major building materials, including brick, portland cement, gypsum board and asphalt roofing materials, is still far below normal, according to a report by the Department of Commerce.

Although brick production rose to a 1947 peak, it still was 9 per cent below the 1946 peak reached in October. Production was 466,477,000 brick in August, 1947, or six per cent above the July total. Cement inventories, however, are reported as dangerously low, even though cement production for the first eight months of 1947 was 1 per cent higher than during the same period in the all-time peak year of 1942. August production was 17,480,000 barrels, or 7 per cent above that of the previous month.

September production of gypsum board and lath, estimated at 300,000,000 sq. ft., was 3 per cent below August performance, and was slightly lower than the average monthly rate for the first eight months of 1947. Production of lath in September, estimated at 145,000,000 sq. ft., was 4 per cent higher than that of the previous month. August shipments of asphalt roofing materials totaled 7,053,000 squares, or one per cent above July, but still not up to normal.

Crushed Stone Production in 1946

OUTPUT OF CRUSHED stone in the United States during 1946, as reported by producers to the Bureau of Mines, totaled 177,477,780 short tons valued at $201,367,266, an increase of 16 per cent in quantity and 25 per cent in value as compared with 1945. Included in this total is stone sold or used for concrete aggregates, railroad ballast, metallurgical use, agricultural limestone, refractory stone, riprap, stone sand, alkali works, calcium carbide works, sugar and glass factories, paper mills, and others.

Crushed stone used for concrete aggregates and railroad ballast (60 per cent of total output in 1946) increased 26 per cent in quantity and 38 per cent in value, compared with 1945. Metallurgical uses, which took 14 per cent of the total crushed and broken stone in 1946, showed a decrease of 9 per cent in quantity and 6 per cent in value.

Limestone for agricultural purposes (13 per cent of the total tonnage of crushed stone in 1946) increased 31 per cent in quantity and 25 per cent in value as compared with 1945. Other uses took 22,271,020 short tons valued at $37,200,022. Limestone constituted 76 per cent of all crushed and broken stone sold in 1946 (excepting that used for cement and lime), and was quarried in all but four states.

Tochigi cement plant, Iwaki Cement Co., showing kiln buildings to the right

Shortage of labor, repair parts and coal holding back increased cement production in Japan. Cement industry suffered little war damage, but some kilns were shipped to Manchuria

By G. RICHARDS GWINN

What Has Happened to the CEMENT Industry In Japan?

CEMENT is one of the few mineral commodities in which Japan[1] is self-sufficient. Portland cement is the major product although five types are manufactured.

Founded by the Meiji Government in Tokyo, the industry in Japan dates from 1873 when the first cement plant was built. The first rotary kiln was put in operation in 1903. The rebuilding program after the 1923 earthquake caused the first large expansion of the cement industry and the Manchurian incident the second. Between 1924 and 1941 a series of four cement associations were formed to administer the production and sale of cement under a corresponding number of control laws promulgated by the government. Peak production was reached in 1940 when 6,002,379 metric tons were produced. At the end of hostilities in August 1945, there were eleven companies operating a total of 36 cement plants in Japan. In addition to plants in the Home Islands there are 14 plants in Manchuria, seven in Korea, and two in Formosa which were owned or controlled by the Japanese. The cement industry suffered very little war damage and the postwar problems are primarily a shortage of coal and repair parts. The salient statistics of the cement industry in Japan from 1925-1945 are shown in Table 1.

[1] This article was prepared while the writer was detailed from the U. S. Bureau of Mines to the Military Geology Unit, U. S. Geological Survey, for assignment to the Natural Resources Section, GHQ, Supreme Commander for the Allied Powers, Tokyo. The research was supported by the Military Intelligence Division, Office of the Chief of Engineers, War Department. Published by permission of the Review Section, Information Division, War Department, and of the Director of the U. S. Geological Survey, Department of Interior.

History

The first plant built as a private enterprise was by the Onoda Cement Company at Onoda in Yamaguchi Prefecture in 1881. In 1883, the second private cement company was formed when Soichiro Asano purchased the government plant at Tokyo, and formed the Asano Cement Company. In 1903, the first rotary kiln was installed at the Asano plant.

In 1940 the Government established the Cement Distribution Company, a legal control unit, which regulated the sale of cement in Japan. Producers then dissolved the Joint Cement Association and formed the Cement Industry Union in conformity with the Government directive. However, in 1941 the Union was dissolved and the Portland Cement Control Association was established as prescribed by the Important Industry Organization Ordinance, which in turn was based on the General Mobilization Law enacted in 1938. From 1941 to the end of hostilities in 1945, cement was purchased and distributed by this association.

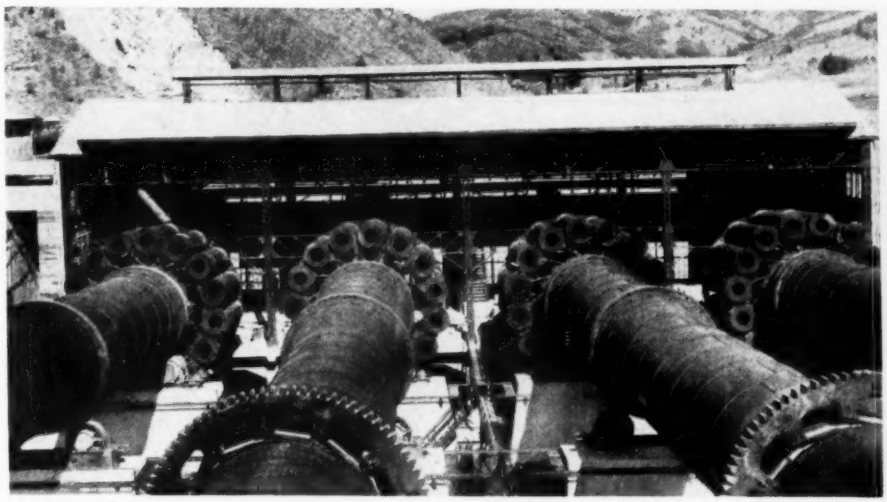
Overall view of Tochigi plant, Iwaki Cement Co.

Types of Cement

Five types of cement are produced in Japan: ordinary portland cement, high-early-strength portland, silica cement, blast furnace slag cement, and non-constructive cement. Silica cement is perhaps a misnomer as it consists of 70 per cent portland clinker and 30 per cent volcanic ash or silicious clay. Blast furnace slag cement consists of approximately equal portions of portland clinker and silicious slag. Non-constructive cement is divided into two grades: Grade A, suitable for floors in kitchens and bathrooms; Grade B, a product which can be used only as a plaster. In addition to the materials mentioned above as constituents of cements, not more than three per cent by weight of gypsum is added to the first three types and not more than five per cent of gypsum and three per cent of lime by weight may be

added to blast furnace slag cement. The production of high-early-strength cement in Japan began in 1930. This also marks the beginning of the wet process method of manufacturing cement in Japan. By 1941 four wet process plants were in operation. Three of these plants are owned by the Asano Cement Co. and the fourth by the Onoda Cement Co. The available information on chemical composition and strength of Japanese cement is shown in Table 2.

The advantages of silica cement as reported by the Japanese are low heat while setting and a very dense product after setting. When the silicious material is ground, extremely fine particles are formed which fill the voids in the cement mortar making it waterproof.



Looking toward firing end of rotary kilns at Tochigi cement plant when plant was completed in 1940. Only two kilns are now operated as the other two had been sent to Manchuria in 1944 for the production of alumina from clay

Production

Production of all kinds of cement steadily increased from 1925 to 1929 reaching a peak of 3,763,697 metric tons in 1929 and then declined during the period of worldwide depression to 3,213,279 metric tons in 1931. The Manchurian Incident which occurred in 1931, the Principal Industry Control Law enacted in the same year, and the founding of the Japan Cement Export Association in 1932, started an expansion in the cement industry which continued with varying intensity to 1940 when annual production reached a peak of 6,002,379 metric tons. Output decreased slightly in 1941 and then sharply to a low of 1,172,373 metric tons in 1945. The decline after 1940 is attributed to decreasing demands, the shortage of labor and the deterioration of equipment in cement mills.

Portland cement including high-early-strength portland made up 97 per cent of the total cement manufactured in Japan from 1925 to 1930, 96 per cent from 1930 to 1935, and 95 per cent for 1935 and 1936. For the 1937-45 period, the quantity of portland cement produced decreased from 92 per cent in 1937 and 1938 to a low of 57 per cent in 1943, then increased to 75 per cent in 1945 (Table 1). The decline in the output of portland cement and the increase of other types is attributed to the war program and the shortage of coal. As the cement industry was not considered strategic, coal allotments were first reduced in quantity and later in quality. As the quantity of coal was reduced, the output of portland clinker and portland cement declined, and the quantity of silica and blast furnace slag cement increased because their requirements of portland clinker are smaller. By 1944 the quality of coal delivered to current plants was so low and the ash content so great that proper fusion of the kiln feed was not obtained, and structural failures of concrete installation were common.

According to Japanese specifications, coal utilized in the production of portland cement clinker must contain 5500 to 7000 calories of heat per kilogram (9940 to 12600 B.t.u. per pound) and not more than 20 per cent ash per metric ton. By 1944 coal received contained only 5000 calories of heat per kilogram (9000 B.t.u. per pound) and 30 per cent ash.

Equipment

The type and quantity of equipment in the cement factories is shown in Table 3. The figures shown for the dimensions of the grinding mills and rotary kilns represent the range in sizes of the equipment in the various plants. The Iwaki Co. owns 26 rotary kilns but only 24 are reported here because two kilns from the Tochigi plant of this company were shipped to Manchuria in 1944 to calcine shale for the aluminum industry. Cement factories suffered little war damage but some plants are operating at only 25 per cent of capacity because ordinary repair parts are not yet available.

Capacity

The capacity figures given in Table 1 for the period 1925-1940 must be regarded as general as they are based on kiln capacity alone. For the 1941-45 period, the number of employes, the number of days worked per month and the quantity of raw materials available as well as the kiln capacity were included in determining capacity

TABLE 1—SALIENT STATISTICS OF THE CEMENT INDUSTRY IN JAPAN, 1925-45
Metric Tons Per Calendar Year

	% of Total	PRODUCTION			STOCKS			EXPORTS	CONSUMPTION	CAPACITY
		Portland	Others	Total	Portland	Others	Total			
1925	97	2,210,414	60,000	2,270,114	105,701	2,300	108,001	217,220	1,944,893	2,753,000
1926	97	2,840,041	60,000	2,900,041	87,302	2,400	89,702	332,716	2,477,623	3,149,000
1927	98	3,189,193	60,000	3,249,193	107,157	2,500	109,657	334,144	2,800,392	3,604,000
1928	97	3,405,272	70,000	3,475,272	72,357	3,000	75,357	337,604	3,062,311	3,811,000
1929	97	3,683,697	80,000	3,763,697	165,132	2,500	167,632	432,968	3,163,097	4,468,000
1930	96	3,190,387	100,000	3,290,387	101,332	2,850	104,182	573,045	2,613,160	4,527,000
1931	96	3,113,279	100,000	3,213,279	128,115	3,600	131,715	1,001,229	2,070,334	4,898,000
1932	96	3,212,430	100,000	3,312,430	88,343	3,200	91,543	967,732	2,253,155	5,233,000
1933	96	4,132,307	162,000	4,274,307	116,318	4,879	121,197	1,254,146	2,898,964	5,482,000
1934	96	4,214,827	186,000	4,400,827	128,271	6,253	134,524	1,325,851	2,940,452	6,182,000
1935	95	5,124,002	268,000	5,392,002	224,598	12,320	236,918	885,773	4,269,311	7,100,000
1936	95	5,272,393	298,530	5,570,923	229,635	13,108	242,743	883,159	4,445,021	7,256,000
1937	91	5,435,641	398,270	5,833,911	235,077	17,422	252,499	882,484	4,698,928	7,866,000
1938	92	5,279,061	626,500	5,705,561	274,057	22,221	296,278	637,510	4,771,773	8,511,000
1939	88	5,271,311	674,360	5,945,671	163,011	20,767	183,778	857,361	4,904,532	8,476,000
1940	73	4,401,601	1,600,778	6,002,379	246,274	76,979	323,253	973,233	4,705,893	7,600,000
1941	77	4,546,078	1,282,381	5,828,459	238,241	79,414	317,655	692,349	4,818,455	6,930,000
1942	73	3,173,807	1,182,216	4,356,023	150,253	84,518	234,771	168,381	3,952,871	6,500,000
1943	57	2,179,719	1,587,967	3,767,666	145,951	105,689	251,640	126,023	3,390,003	4,928,000
1944	64	1,925,152	1,034,534	2,959,686	88,478	39,752	128,231	31,530	2,799,925	4,490,000
1945	75	877,919	294,354	1,172,373	93,583	37,690	131,273	0	1,041,100	3,000,000

TABLE 2—CHEMICAL COMPOSITION AND STRENGTH OF JAPANESE CEMENT—1944

Type [a]	No. of Prod.	AVERAGE CHEMICAL COMPOSITION											STRENGTH						
														Bending (Kg/Cm²)			Compression (Kg/Cm²)		
		Ign. Loss	Insoluble Matter	SiO_2	Al_2O_3	Fe_2O_3	MnO	CaO	MgO	SO_3	S	Total	Fine-[b] ness	3 Days	7 Days	28 Days	3 Days	7 Days	28 Days
OPC	27	1.95	1.05	22.06	5.30	3.72	0	62.85	2.00	1.40	0	100.33	1.78	13.6	34.3	53.0	71.9	125.0	255.6
HESC	4	1.73	.57	21.20	5.28	3.26	0	64.77	1.42	1.24	0	99.47	1.70	26.7	45.7	58.4	116.6	216.0	353.6
BFSC	12	2.31	2.30	26.45	8.20	2.70	0.40	55.83	2.25	1.53	0.41	100.40	2.06	15.1	24.1	43.9	50.1	80.7	196.4
SC	12	2.95	16.94	32.04	11.20	3.54	0	46.52	2.40	1.60	0	100.75	1.74	15.2	25.4	43.7	49.1	92.4	208.9
NC	4	[c]	[c]	[c]	[c]	[c]	[c]	[c]	[c]	[c]	[c]	[c]	3.00	1.3	21.1	37.3	0.0	72.5	166.6

[a] OPC—Ordinary Portland Cement. HESC—High Early Strength Cement. BFSC—Blast Furnace Slag Cement. SC—Silica Cement. NC—Non-Constructive Cement. [b] Percent Residue on 4900 mesh/cm² screen. [c] Data Not Available.

and it is believed, therefore, that the figures reported for the latter period are more accurate. The cement industry was overdeveloped and capacity in 1938 was 34 per cent greater than demand. This situation was brought about by a government control act, which fixed the quantity of orders allotted to the individual companies on the basis of plant capacity. Each plant, therefore, enlarged its capacity in an effort to obtain more orders.

At the end of the first quarter of 1946, 36 plants were in operation with a total monthly capacity of 275,000 metric tons. When repairs are made it is expected that the monthly capacity will be 375,000 metric tons.

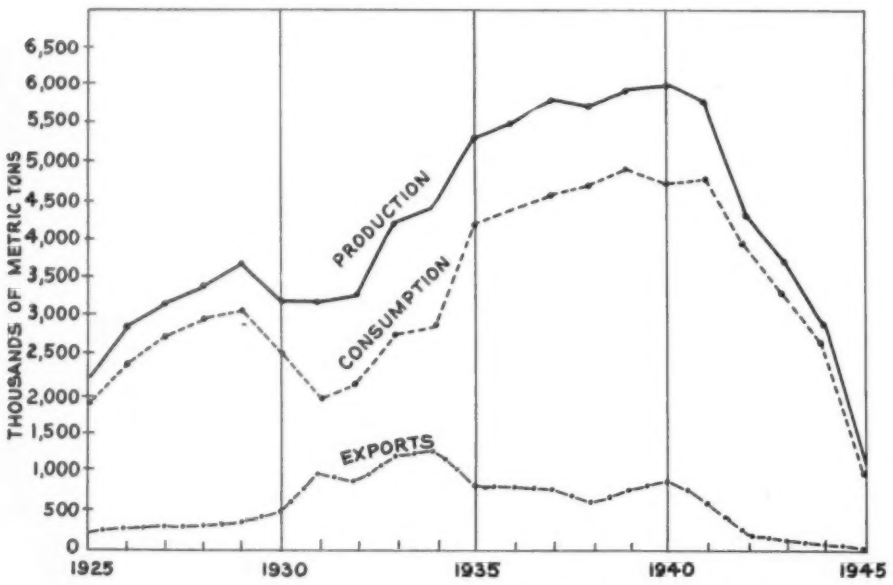


Fig. 1: Production, consumption and exports of cement in Japan proper, 1925-1945

Consumption of cement in Japan Proper for the 1925-45 period is shown in Table 1 and in graphic form in Figure 1. The trend of consumption with a few minor exceptions follows closely that of production. Year end stocks at cement plants ranged from a low of 75,357 metric tons in 1928 to a high of 323,253 metric tons in 1940. With respect to production and consumption, stocks appear unusually low.

The sharp increase in consumption in 1935 and the continuation of the upswing to a peak of 4,904,532 metric tons in 1939 is attributed largely to increased construction requirements attending the recovery, and war programs. After a decline in 1940 and a slight upswing in 1941, consumption declined sharply to a low of 1,041,000 metric tons in 1945. The decline after 1939 is attributed to labor shortages, restrictions on non-essential industries, decreased demand brought about largely by the completion of the wartime construction program, and an almost complete cessation of normal industrial projects.

Figures on the consumption of cement by use are available only since 1931, and are shown in Tables 4 and 5. The information is arranged in two tables because of an almost complete change in use pattern in 1940. Industrial Construction was the largest individual consumer of cement in the 1931-39 period; followed by Public Works. Consumption by the Army and the Aircraft Industry reached a peak in 1943 and the Navy in 1944. Strategic Industry requirements reached a peak in 1941 which implies that installations and buildings for war

TABLE 3—EQUIPMENT AT CEMENT FACTORIES IN JAPAN PROPER, 1945

Cement Company	No. of Plants	Grinding Mill Raw Material Diam.-Length-M.	Number of Mills	Rotary Kiln Diam.-Length-M.	Number of Kilns	Clinker Grinding Mill Diam.-Length	Number of Mills
		2.1 x 6.7		3.4 to 3.1 x 59.6		1.8 x 6.7	
Asano	10	2.5 x 14.0	34	3.8 to 3.3 x 72.0	16	2.4 x 14.0	28
		2.1 x 7.3		2.7 to 2.5 x 44.8		1.6 x 6.0	
Iwaki	7	2.2 x 13.0	25	3.4 to 3.1 x 88.0	24	2.2 x 13.0	25
		1.5 x 3.5		3.2 to 2.7 x 48.7		1.8 x 3.0	
Onoda	9	2.1 x 7.3	25	3.7 to 3.4 x 70.0	15	2.5 x 15.0	17
		2.1 x 7.3		3.2 to 2.7 x 60.0		1.8 x 4.8	
Ube	2	2.4 x 16.0	11	3.6 to 3.4 x 74.0	5	2.5 x 15.0	10
		2.1 x 7.9				2.1 x 7.9	
Osaka Yogyo	2[a]	2.7 x 9.1	10	3.8 to 3.3 x 73.6	6	2.7 x 9.1	11
		1.8 x 6.2		3.5 to 3.2 x 60.0		2.1 x 7.9	
Chichibu	1	2.4 x 12.0	10	3.9 to 3.2 x 79.4	5	2.2 x 13.0	10
Tokuyama	1	2.4 x 14.0	2	3.6 x 80.0	2	2.6 x 14.0	2
		1.2 x 3.8					
Mitsui	1	1.3 x 7.6	3	2.2 x 45.7	1	1.7 x 6.7	2
		2.2 x 13.0		3.5 to 3 x 60.0		2.2 x 13.0	
Sangyo	1	2.1 x 7.0	2		2	1.5 x 6.0	2
Nippon Koro	1	2.4 x 14.0	2	3.0 to 2.7 x 54.8	4	2.2 x 12.0	8
				2.8 x 28.1		3.1 x 7.3	
Nittetsu	1	2.2 x 13.0	4	2.3 x 37.8	4	2.2 x 12.0	5
TOTAL	36		129		84		120

[a] One plant is only a cement grinding mill.

TABLE 4—CONSUMPTION OF CEMENT IN JAPAN PROPER BY USE, 1931-39

Metric Tons Per Calendar Year

Use	1931	1932	1933	1934	1935	1936	1937	1938	1939
Railway	272,072	273,295	314,485	273,870	226,742	294,481	349,445	369,331	274,948
Electric Works	85,265	92,550	135,667	189,838	261,171	278,697	502,965	746,394	618,482
Harbors	77,255	89,011	177,782	122,816	94,940	115,898	141,710	137,979	124,425
Roads and Bridges	261,479	348,152	433,927	297,685	256,303	308,911	303,819	274,768	241,567
Industrial Construction	544,403	564,828	796,740	827,054	960,178	1,276,233	1,492,254	1,604,598	1,674,578
Public Works	270,263	292,622	389,340	317,077	349,156	487,043	470,758	540,020	600,881
Others	559,517	592,697	651,023	912,112	2,120,821	1,683,758	1,434,977	1,098,683	1,369,451
TOTAL	2,070,334	2,253,155	2,898,964	2,940,452	14,269,311	4,445,021	4,698,928	4,771,773	4,904,532

plants and heavy industry were completed or nearly so at that time. It also appears from Table 5 that work on air raid shelters did not begin until 1944, and as reported from other scources, the quantity allocated to this use was far short of requirements. The Tokyo area particularly was woefully lacking in air raid shelters. It is reported by the Japanese Portland Cement Control Association that cement reported under "Other" in Table 4 corresponds to "General Civilian Use" in Table 5, and "Industrial Construction" in Table 4, is identical with "Strategic Industries" in Table 5.

Prices

The average mill, wholesale, and retail prices of cement in yen per metric ton in Japan Proper in the 1935-45 period, as reported by the Japanese Portland Cement Control Association, are shown in Table 8. June 1946 prices are also shown in this table. The first sharp increase in price was reported in 1940 when wholesale and retail prices increased 3, and 7 to 10 yen respectively, over the previous year's figure. The spread between the three prices also increased in 1940. The second sharp rise occurred in 1945 when all prices increased from 79 to 100 per cent. Continued inflation in the year after the cessation of hostilities caused another sharp rise in prices in 1946. The cement companies report that even the June, 1946, prices are too low as production costs have reached 550 yen per metric ton.

TABLE 5—CONSUMPTION OF CEMENT IN JAPAN PROPER BY USE, 1940-45

Metric Tons Per Calendar Year

	1940	1941	1942	1943	1944	1945
Army	496,034	421,069	507,823	752,101	604,535	184,454
Navy	383,905	399,126	673,445	778,762	895,512	208,917
Aircraft	271,000	283,000	258,000	268,000	198,325	105,635
Shipbuilding	117,000	130,000	130,000	160,000	106,656	54,806
Railway	230,000	223,000	123,000	118,000	121,668	64,734
Strategic Industries	1,485,019	1,646,104	1,139,175	713,618	511,390	244,037
Public Works	164,689	207,243	238,890	235,454	122,968	21,071
General Civilian Use	1,558,246	1,508,893	882,539	364,068	196,942	135,667
Air Defense	0.	0	0	0	51,936	21,779
TOTAL	4,705,893	4,818,435	3,952,872	3,390,003	2,799,925	1,041,100

Exports

Exports of cement from Japan Proper for the 1925-45 period are shown in Table 1 and by country of destination in Table 7. Information on destination of shipments is available for the 1931-40 period.

TABLE 6—THE CEMENT PRODUCTION IN JAPAN, FORMOSA, KOREA AND MANCHURIA, 1926-44*a*

Metric Tons

Year	Japan	Formosa	Korea	Manchuria	Total
1926	2,900,041	127,060	127,417	127,418	3,281,936
1927	3,249,193	125,020	146,266	112,131	3,632,610
1928	3,475,272	121,037	157,558	151,909	3,905,776
1929	3,763,697	129,507	255,938	205,711	4,354,853
1930	3,290,387	118,845	246,411	194,509	3,850,152
1931	3,213,279	129,220	232,154	162,042	3,736,695
1932	3,312,430	115,644	212,428	108,793	3,749,295
1933	4,274,307	146,285	247,734	184,843	4,853,169
1934	4,400,827	141,358	222,385	232,565	4,997,135
1935	5,392,002	145,095	459,570	377,046	6,373,713
1936	5,570,923	142,267	567,203	581,773	6,862,166
1937	5,833,911	148,212	664,352	788,260	7,434,735
1938	5,705,561	142,106	1,055,111	1,024,458	7,927,236
1939	5,945,671	221,186	1,095,538	1,044,507	8,306,902
1940	6,002,379	226,414	1,142,503	1,017,463	8,388,759
1941	5,828,459	212,280	1,215,328	1,163,723	8,419,790
1942	4,356,023	228,107	1,181,429	1,532,134	7,297,693
1943	3,767,666	309,394	1,190,083	1,503,036	6,770,179
1944	2,959,686	245,000	1,003,303	1,137,892	5,345,881

a 1926-44 calendar year for Japan; 1926-41 calendar year for Korea, Formosa and Manchuria 1941-44 fiscal year

TABLE 7—THE EXPORT OF CEMENT FROM JAPAN PROPER, 1931-40

Metric Tons Per Calendar Year

	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	Total
British India	29,182	54,729	56,384	56,919	49,143	49,437	59,152	55,323	42,388	4,484	457,141
Burma	20,181	12,539	12,318	10,072	6,941	4,936	4,767	1,361	51	0	73,166
North China	7,617	19,254	9,366	17,362	15,802	19,800	28,170	44,166	53,465	4,296	219,298
South China	94,155	20,779	31,866	18,590	15,154	3,224	901	28,646	22,939	807	237,061
Dutch East Indies	107,379	123,779	103,092	51,604	55,844	46,531	80,765	93,582	83,416	10,051	756,043
Hong Kong	164,905	101,558	101,130	78,459	83,314	64,807	30,637	0	910	0	625,720
French India	4,811	5,701	20	68	0	0	204	129	0	0	10,933
Philippine	20,239	13,565	4,567	2,352	990	2,023	6,472	55,776	13,598	26	119,608
The Straits Settlements	87,256	39,885	38,651	64,601	87,807	90,812	87,144	30,565	39,021	9,054	574,796
Siam	9,323	1,979	7,540	3,507	5,551	6,481	2,582	0	0	0	36,963
Russian Asia	613	1,926	944	1,439	181,241	103,614	216,471	564	528	0	507,340
North America	6,895	5,904	3,334	3,502	3,728	49,078	21,470	12,855	9,700	1,105	117,571
South America	270	349	8,216	10,976	8,313	9,244	12,424	20,389	22,804	6,177	99,162
Africa	7,219	11,424	22,950	8,786	10,219	16,021	20,502	20,223	12,017	1,921	131,282
Others *a*	441,184	554,361	853,768	997,614	361,726	417,151	310,823	273,931	536,524	935,312	5,682,394
TOTAL	1,001,229	967,732	1,254,146	1,325,851	885,773	883,159	882,484	637,510	837,361	973,233	9,648,478

a Formosa, Korea, Manchuria Mandated Islands.

Gen. MacArthur's Headquarters in Tokyo, Japan, the Dai Ichi Building

Exports increased at a regular rate from 217,220 metric tons in 1925 to 573,045 metric tons in 1930. In the following year a sharp increase occurred and exports reached a peak of 1,325,851 metric tons in 1934. The sharp decline in 1935 is attributed largely to the restrictions imposed by the Principal Industry Control Law. With the exception of a slight decline in 1938, exports continued approximately at the 1935 level to the outbreak of the war with the United States, and then declined rapidly and ceased entirely in 1945. The trends in exports is shown graphically in Fig. 1.

For the 1931-40 period (Table 7), 59 per cent of exports were shipped to various parts of the Japanese Empire. The Dutch East Indies, which accounted for 8 per cent of exports, was the largest single purchaser and was followed closely by Hong Kong, Strait Settlements and Russian Asia. It is reported that a large part of the material shipped to the Russian territory was used in the construction of border fortifications for protection against the Japanese.

The Portland Cement Control Association reports that most of the Empire shipments were for war purposes with the possible exception of material exported to Korea. Cement exports to Korea came largely from plants on Kyushu which could ship their product by water to Korea at a lower cost than rail transportation within the Home Islands. Shipments were also made to Korea by cement companies in Japan Proper, which did not have factories in Korea, in order to maintain their foreign market.

Postwar

The problems of the cement industry after the cessation of hostilities in August 1945 were largely a shortage of labor, repair parts and coal, as the plants suffered little war damage. At the end of the first quarter of 1946, 36 plants, with a total monthly capacity of 275,000 metric tons, were in operation, and were producing at about 25 per cent of capacity. When repair parts are available it is expected that rated monthly capacity will reach 375,000 metric tons. Production, however, will be limited by the quantity of coal available containing at least 5,500 calories of heat per kilogram and not more than 20 per cent ash per metric ton.

Cement Production in the Japanese Empire

Production of cement in Japan Proper, Formosa, Korea and Manchuria for the 1926-44 period is shown in Table 6. The output from Formosa came from the Takao plant of the Taiwan Cement Co., which has three rotary kilns and a rated annual capacity of 380,000 metric tons, and the Suo plant of the Taiwan Kasei Co., with two rotary kilns and a rated annual capacity of 180,000 metric tons. The Nampo Cement Co. built a plant at Shinchiku, but did not get into production. Korean production came from seven plants, five of which are located north of the 38th parallel. The plants at Komosan, Sennairi, Hijo and Sanchoko are owned by the Onoda Cement Co. of Japan, and have a combined annual capacity of 906,000 metric tons. The remaining three plants are the Hozan plant of the Asano Cement Co., Heijo plant of the Oryokko Sudien Co., and the Kaishu plant of the Chosen Cement Co., with anual capacities respectively of 408,000, 150,000 and 313,000 metric tons. The Hijo and Sennairi plants of the Onoda Cement Co., the Kaishu plant of the Chosen Cement Co., and the Hozan plant of the Asano Co. each have three rotary kilns. The remaining plants have one kiln each.

There are 14 cement plants in Manchuria with a combined annual capacity of 2,200,000 metric tons. However, one of the plants has only a clinker grinding mill and another was converted in 1941 to the production of alumina. The Manchurian Onoda Cement Co. owns the plants at Kiangtungtsun, Wenchun Chwantoutsun, Aushan, Hsiaotun, Miaoling and Dairen. The plants at Kirin, Hsichien and Fushun are owned by the Manchurian Asano Cement Co. and those at Omeichwang, Penhsihu and Hsinfaku by the Manchurian Iwaki Cement Co. The Antung Cement Company's plant at Antung was converted to the production of alumina and the Kirin plant of the Kirin Synthetic Oil Co. was completed but did not get into production.

TABLE 8—PRICES OF CEMENT IN JAPAN PROPER, 1935-46
Yen Per Metric Ton

Year	Mill	Wholesale	Retail
1935	17.00	19.00	20.00
1936	17.00	19.00	20.00
1937	17.00	20.00	21.00
1938	18.80	21.20	22.20
1939	18.20	21.20	22.20
1940	18.20	24.20	29.20-33.00
1941	18.40	24.20	29.20-33.00
1942	25.75	31.00	38.40
1943	29.72	35.25	42.65
1944	41.00	51.80	63.50
1945	83.60	101.40	113.10
1946a	240.00	300.00	335.00

Source: Portland Cement Control Association.
a June, 1946 prices.

Winter Closes Alaska Quarry

PERMANENTE CEMENT CO. has announced that the Dall Island, Alaska, quarry, which furnishes high grade limestone for the Diamond Division plant in Seattle, Wash., recently closed for the Winter. As a fitting climax for a season that shattered all production records for a twenty-year period, a final coyote and well drill shot brought down an estimated 200,000 tons of rock, ready for use when the quarry opens in the Spring of 1948. The shot was engineered by Pacific Powder Co.

In the season just closed, the quarry records show 220,000 tons of stone crushed and loaded to the Permanente transport SS Diamond Cement for transport to the mill in Seattle. The ship is now in Seattle undergoing her annual repairs. Dave Gray is quarry superintendent and Captain Harold Larson is in charge of the ship. Both the Seattle mill and the Alaska quarry are under the direction of Gordon Tongue, division manager.

Boost Phosphate Capacity

INTERNATIONAL MINERALS & Chemical Corp., Chicago, Ill., has increased the capacity of its Noralyn, Fla., phosphate plant through addition of new drier facilities, according to Franklin Farley, vice-president, Phosphate Division. The new mine and drier installation at Noralyn will increase the company's phosphate capacity about 300 per cent.

Rust Engineering Co., Pittsburgh, Penn., is designing and constructing the drier installation, which is expected to be in operation late in 1948. The mine proper will begin production of phosphate rock in February and its output will be dried in other company facilities until the new equipment is completed.

Anti-Trust Fine Taxable

A RECENT RULING of the United States Tax Court, Washington, D. C., has held that money paid to settle an anti-trust suit cannot be claimed as a tax-exempt business expense. This ruling holds true even though the company claims to have been innocent, as in the $19,000 fine levied against the Universal Atlas Cement Co., New York, N. Y. The reason the case was settled, according to the company, was that $66,000 had already been spent in preparing briefs, etc., and lawyers advised that the final sum would amount to more than the $100,000 represented by the fine.

Fluorspar Sink-Float Plant

KENTUCKY FLUORSPAR CO., Marion, Ky., recently started operation of its new heavy media separation plant, according to R. N. Frazer, president. This installation is the latest among half a dozen sink-float plants installed in this area.

New and Revolutionary Method of

LIME MANUFACTURE

New England Lime Co. makes chemical lime with new FluoSolids process, employing reactor operating basically on same principle as gasoline "cracking" process

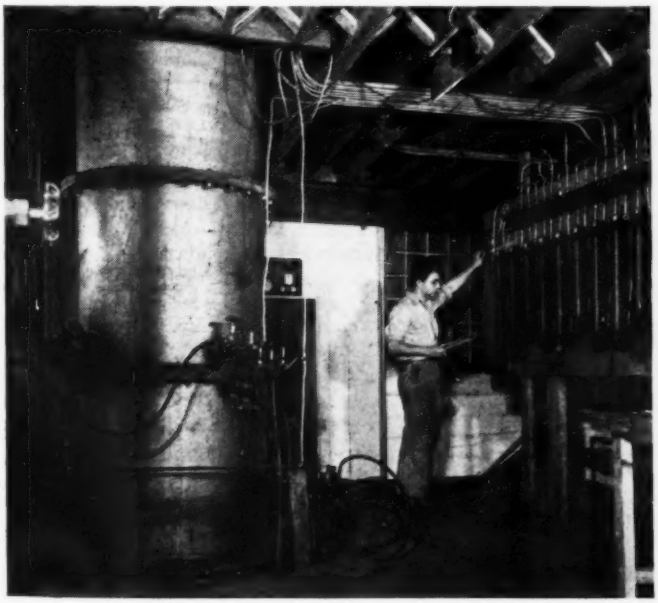
By WALTER B. LENHART and NATHAN C. ROCKWOOD

THE NEW ENGLAND LIME CO., Adams, Mass., under its progressive president, Chauncey C. Loomis, has pioneered and aided in the development of a new process of lime manufacture which may revolutionize methods now employed in production of certain types of lime, particularly those for special chemical uses. Mr. Loomis, as his contemporaries in the lime industry well know, is a chemist and chemical engineer, who is credited with the successful development of a plant in the United States for using the Canadian Pidgeon process of magnesium production from dolomitic lime. Subsequently he has worked out a similar process for the production of calcium.

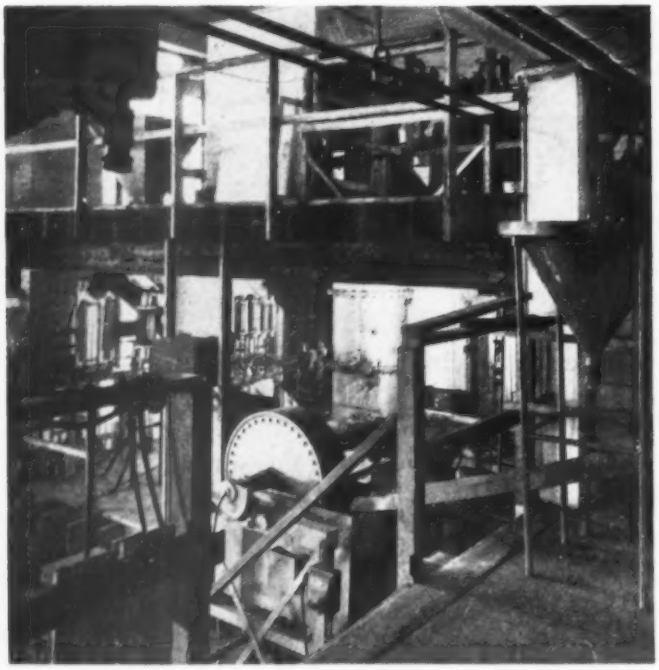
The new lime kiln, which has now been in successful operation for several months, uses what is known as the Dorrco FluoSolids system. This system or process is essentially very simple, depending on the fact that finely divided solids may be kept in a "fluid" state by suspension in air or other gas. Rock products manufacturers are familiar with the phenomenon as it is the principle employed in handling materials in the Fuller-Kinyon pump (for cement, lime, etc.), and in a similar system of blending raw materials in the dry process of cement manufacture.

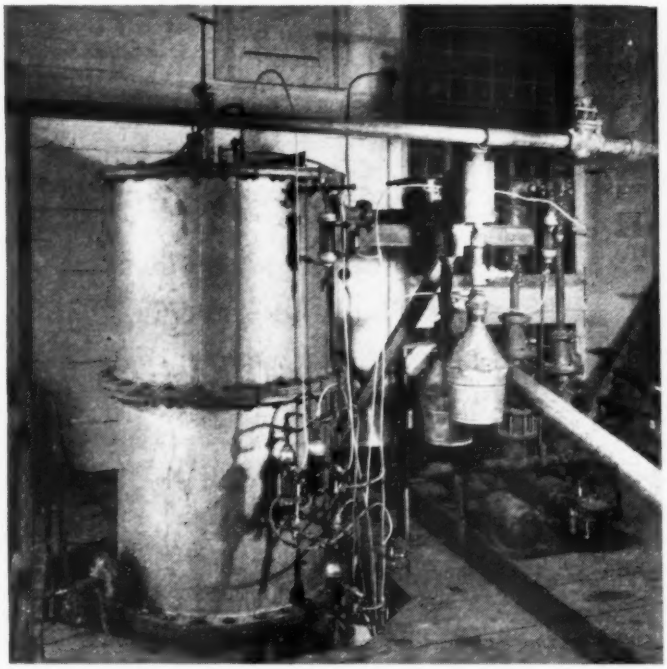
The present novelty consists in utilizing this fluid-solid mass to carry out chemical reactions, of which the calcination of fine particles of limestone, or other forms of calcium carbonate, is only one. This fundamental principle was first developed and applied with spectacular success by petroleum engineers to the "fluid-solid catalyst" production of high octane gasoline during the war. The Dorr Co. is licensed under Standard Oil Development Co. patents to make application of the process to a broad field of mining and metallurgy, under which lime manufacture and other possible processing in the rock products industry comes. The only important limitation governing the use of the FluoSolids system is that it must be possible to effect the intended reaction at temperatures that do not soften or fuse the solids during treatment.

As used for calcining limestone, or any other material, the system is a continuous one with cold, sized, finely ground materials fed into the top of the reactor or furnace with suitable feeders, and the calcined and relatively cool product is withdrawn from the reactor continuously at the bottom. The term "reactor" has been adopted by the Dorr Co. to designate the unit in which the FluoSolids reaction takes place and is synonymous with "kiln" or "furnace" as used in the lime and other industries. The time of treatment in the reactor is that required for the average sized particle; in the case at Adams, it is adjusted to give limes calcined 95 to 99 per cent (plus) of the total. The passage of the limestone through the reactor along with the heat treatment is so easy and burning so "soft" that in many cases the original physical structural characteristics of the limestone are retained in the lime. The wear and tear on the brickwork and the "constriction plates" is very little, and the



Left: Operating floor of Fluosolids reactor in Dorr Co.'s Westport, Conn., pilot plant; manometer panel at right. Right: Another view of operating floor; flowmeter panel at right. Capacity is about one ton of $CaCO_3$ in 24 hrs.





Left: General view of FluoSolids pilot plant at Westport, Conn. Right: Top of reactor in pilot plant

pilot kiln at the New England Lime Co. shows that ordinary fire-clay brick lining is practically as good as new after 11 months of intermittent use. This negligible destructive effect on the lining of course is one of the many favorable aspects of the system.

FluoSolids Lime Reactor

Utilization of the fluid-solids principle in a lime reactor consists in keeping the limestone particles in suspension or "in teeter," as they would be in a liquid medium, at a temperature higher than the ignition temperature of the fuel used in the calcination chamber of the reactor. When the fuel is then injected, it will burn on and around the particles, under the most favorable thermal conditions for efficient heat transfer. Once the process has begun it can be controlled with accuracy through the amount of feed and fuel, and the amount of air admitted for keeping the material in suspension, for this determines the time element for holding the material at any desired temperature. All these factors are under instrumental control which with experience can become almost automatic in actual operation.

The initial pilot reactor installation of the New England Lime Co. has been in operation for nearly a year, and it is now believed all the kinks have been ironed out. On the basis of the experience gained in the operation of this 5- x 26-ft. (inside dimensions) pilot reactor designed for a capacity of 8½ tons per 24-hour day, designs have been completed and installation will soon be made at the same plant of a similar reactor having 100 tons per day capacity. The full-size reactor will have some improvements, as described farther on in this article, designed to increase the fuel efficiency, which even in the pilot reactor equals any yet regularly obtained in lime manufacture. The pilot reactor has produced up to 15 tons per day, operating best at 11 tons and

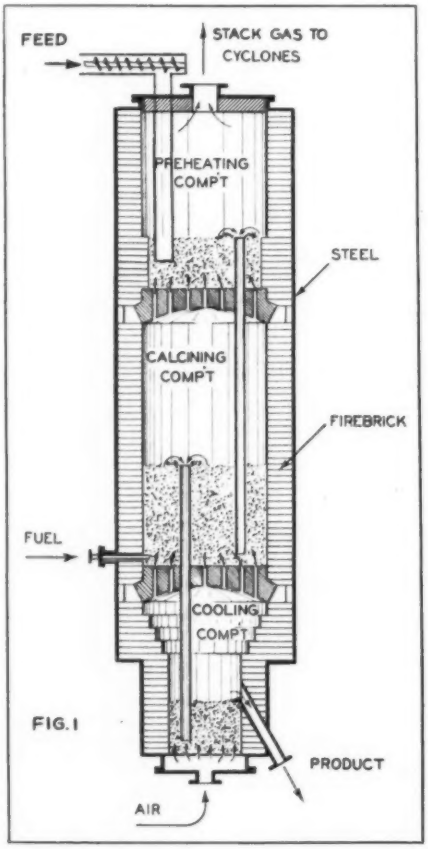


Fig. 1: Cross section of FluoSolids reactor pilot plant, showing three zones, preheating, calcining and cooling, separated by perforated domed refractory partitions or "constriction plates"

with a consumption of about 42 gal. of Bunker C. fuel oil per ton of lime produced. This works out about 6,250,000 B.t.u. per ton of lime. Since a ton of good bituminous coal contains about 28,000,000 B.t.u., this is the equivalent of about a 1:4½ ratio as usually estimated, assuming that perfect combustion is obtained from the coal as ordinarily burned in a shaft kiln, which of course is never the case.

The pilot reactor is a steel-shell cylinder approximately 7 x 26 ft., lined with refractory brick, 9 in. thick, and with 3 in. of insulation between these and the steel shell, so that the inside dimensions are, as already given, about 5 x 26 ft. The steel cylinder stands upright, and resembles in outward appearance, a standard shaft lime kiln. Like a shaft kiln this pilot reactor has three zones — preheating, calcining and cooling—but in this case the zones are actual compartments, separated from one another by perforated domed refractory partitions, or "constriction plates," as shown in the accompanying sketch, Fig. 1. The proportioning of these compartments is a matter of scientific determination to conform to the theoretical processing involved, and might be varied for different raw materials. The 100-ton reactor will be a steel cylinder, with conical ends, approximately 13½ x 42 ft., divided into five compartments instead of three.

Operating Details

The three compartments of the pilot reactor are formed by the so-called perforated, "constriction" plates, of arched fire-brick construction, so as to divide the vertical shaft into three sections. In each plate are a number of holes for passage of gases. The

raw material is fed into the top of the reactor by a Link-Belt screw conveyor, through a steel feed pipe. This tube extends to near the floor or bottom of the top compartment. The outlet of this compartment is through a similar tube that extends through the constriction plate to near the bottom of the second compartment (calcining zone). Thus in operation the top compartment is always full to a pre-determined level, and as feed is admitted to this compartment, an equal amount of flow is discharged to the compartment below.

By referring to Fig. 1, it will be readily seen that the three compartments, (1) preheater, (2) combustion and calcining, and (3) the cooler, air-preheating compartments always contain a prefixed amount of material. In starting the reactor, a large torch is fired into the air stream in the bottom to preheat the limestone to the ignition point of the fuel oil used. This is about 1100 deg. F. When the limestone in the combustion zone is at this temperature, fuel oil is injected into the mass, without spraying of any kind, through eight nozzles located and equally spaced around the periphery and near the bottom of the combustion compartment. A Nash rotary compressor supplies the air. With the great excess of hot surface area available, combustion is complete, and what is more important, the combustion is immediately adjacent to and on the surface of the limestone particles. All of the air for combustion is thus supplied and preheated in cooling the lime.

The depth of the charge in the combustion zone can be varied, depending on the type of lime desired and other operating conditions; but regardless of the depth of the charge, the temperature of the charge has been found to be practically the same throughout at any point in the charge. The amount of oil from each injection tube is the same and is controlled through an 8-cylinder, piston-type adjustable pump that delivers a measured and identical amount of oil to each of the injection tubes. If an increase or decrease in the total amount of oil going to the furnace is wanted, this is controllable through a variable-speed motor of wide range that runs all eight cylinders. As the temperature rises, an increase in the flow of stone holds the temperature to the desired point. In the pilot reactor it was found that 1700 deg. F. was about suitable for most limes. The temperature of the stone entering the calcining compartment is about 1100 deg. F.

It will be seen that in each compartment, from the dimensions shown, a certain amount of free space is above the material. The amount of this space necessarily varies with the nature of products being treated, but is chiefly intended for settling some of the dust entrained in the hot gas streams. This space is referred to as "the freeboard."

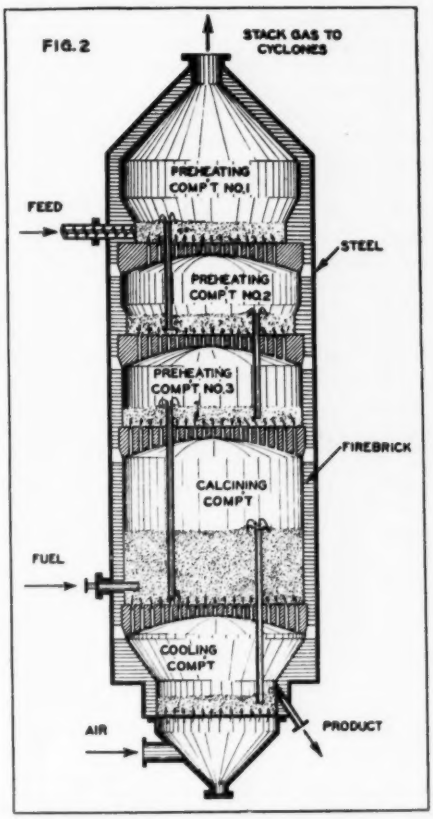


Fig. 2: A 100-ton reactor with conical ends, divided into five compartments instead of three

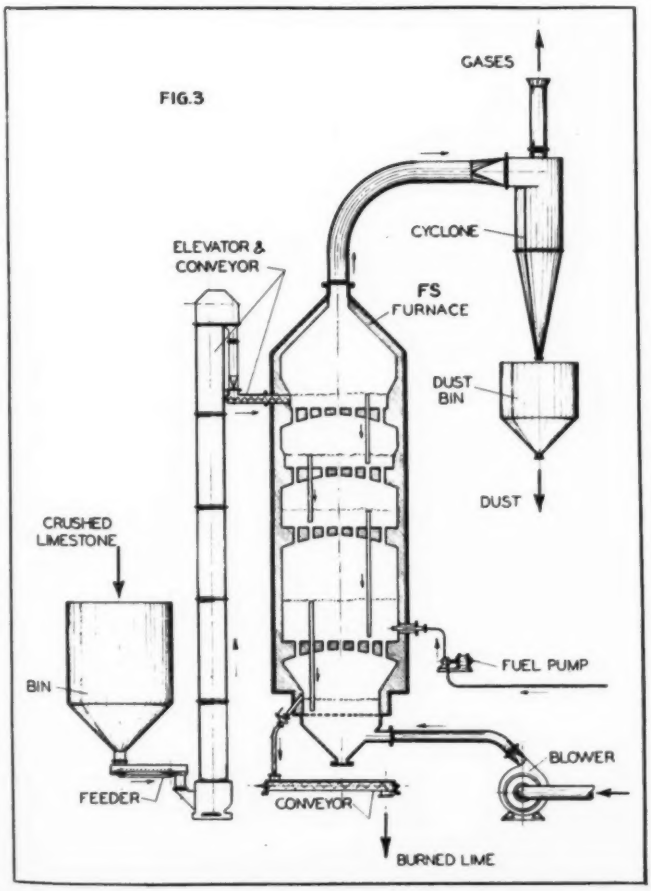


Fig. 3: Flow diagram illustrating the arrangement of a five-compartment reactor and auxiliaries for the commercial calcining of limestone

Inasmuch as it is impossible to see into the reactor while it is in operation, control is through a group of eight monometers that indicate to the operators the exact amount of material in each compartment. Foxboro recording pyrometers show the temperatures of the fluid-solid mass in the reactor which is closer to the actual calcining temperatures than can be measured in other types of kilns. A Jeffrey vibrating feeder gives control of the amount of feed.

The pilot reactor of the New England Lime Co., as already noted, was designed for a capacity of 8½ tons per day, but has delivered on occasion up to 15 tons. It uses from 42 to 43 gal. of oil per ton. Where finely divided coal is used for fuel it is expected that equivalent fuel ratios will be obtained. Where natural gas is used the fuel consumption in total B.t.u. will also parallel that of fuel oil. Thus it will be seen that a fuel consumption is effected which is equal to modern shaft kilns (6,500,000 B.t.u. per ton). In the reactor at Adams, radiation losses were in the 13 per cent range, but in the larger reactors it is hoped to reduce this considerably. Dust losses at the New England Lime Co. reactor on the minus 6-mesh, plus 80-mesh feed were in the 5 to 10 per cent range, and these fines are collected in four small dust collectors operating in parallel. The collectors are of the cyclonic type and were constructed at the plant. This dust, al-

though wasted at the pilot plant, should not be construed as a loss for in its finely divided state is a saleable by-product.

It will be seen from the foregoing that calcination depends on the average time of each particle in the reactor but this factor can be pre-calculated and controlled to such a degree that the final product is a designed one. In the pilot plant the single cooling zone used lowered the temperature of the discharge product to about 500 deg. F.

The alloy tubes used for passage of the materials from compartment to compartment are of stainless steel consisting of 28-12 alloy (28 per cent Cr and 12 per cent Ni). These tubes have a long life at 2000 deg. F. temperatures.

In the operation of the pilot plant it was found that temperature controls could be exercised to a remarkable degree and that minus 6-mesh, plus 80-mesh limestone could be calcined at temperatures near the theoretical. This mild calcination has developed limes that are remarkably active. However, due to the extreme flexibility of the system higher temperatures can be used, enabling the operators to produce harder burned materials.

It should not be inferred that the system can be used only for materials in the screen size range given, for in practice it has been found that finer sizes can be calcined if such calcination is done in separate charges or in separate furnaces. It is said to be possible to calcine material from the minus 80-mesh to 200-mesh.

The size of future reactors will be limited to the diameter possible of the constriction plate, and it is expected from present-day knowledge that 100-ton capacity reactors will be about the top limit. A five-furnace plant to make 500 tons per day would probably have better fuel economy than a rotary kiln and would give operating flexibility. The life of the FluoSolids reactor lining will be many years as indicated by the New England Lime Co.'s operation of the pilot plant.

There is no flow of material downward through the holes in the constriction plate as the upward currents of hot gases prevent this. There are no suction fans on the outlet gases. They flow through the dust collectors by the internal pressures set up within the kiln by the flow of hot air and by the liberation of CO_2 from the limestone. There has been no soot or off-colored materials in any of the product.

It will be obvious that in such a reactor the amount and temperature of CO_2 issuing from the kiln can be controlled within narrow limits enabling delivery of CO_2 for by-product purposes.

Other Possible Applications

The FluoSolids system as developed by the Dorr Co. will be made available to the various industries through a complete chain of endeavors starting with the research and experimental work necessary and carried out at the company's Westport, Conn., laboratories. From this work, plant designs will be made and the plants constructed and initially operated under the supervision of the Dorr Co.'s engineers.

It will be seen from the foregoing that the joint efforts of the New England Lime Co. and the Dorr Co. have for the first time developed a workable calcining method for fine-ground limestones, which will produce high quality products at low costs. To other operators who have a calcining, oxidation, reduction, or heat reaction process as a part of their industry, no one at present can accurately predict just what FluoSolids technique can do for them.

Work at the Westport laboratory is under way on lime sludges from water purification and paper mills; and on many metallic ores.

At Westport the Dorr Co. has several pilot plant reactors for preliminary work, of the single-stage experimental type; i.e., there is only the combustion zone — no preheating or cooling chambers.

Personnel

Official personnel includes: New England Lime Co., Chauncey C. Loomis, president; Frank S. White, assistant to Mr. Loomis; David Follett, general superintendent. The Dorr Co. official personnel involved in this development includes: J. V. N. Dorr, president; F. A. Downes, vice-president in charge of development; R. P. Kite, in charge of FluoSolids developments; George Darby, manager Westport research laboratories; E. J. Roberts, director of research, Westport, in charge of laboratory work relating to FluoSolids; R. B. Thompson, research investigator at Westport.

Agricultural Limestone At Farm Show

HENRY A. HUSCHKE, managing director, Agricultural Limestone Division, National Crushed Stone Association, was in charge of the recent exhibit sponsored by the association at the National Farm Show, in Chicago, Ill., November 29 through December 7. To catch the eye of visitors, the booth contained a continuous display of color slides of farm scenes and subjects pertinent to the use of agricultural limestone.

Backdrop for the booth comprised a series of posters urging the use of proper land-care aids, and on a table across the back was a complete chemical set for making lime-requirement soil tests. A small table in front of the section held a pan of prepared agricultural limestone plus stacks of the three types of literature published by the association. The three pieces of literature, familiar to all members of the Association, are: Repair and Rebuild with Limestone and Legumes; Lime Your Pastures; and Agricultural Limestone, the Farmer's Friend.

Interest in the exhibit was shown by county agents, farmers, agricultural vocational school teachers and 4-H boys and girls whose club had nearby exhibits.

Voluntary help in staffing the booth was provided by C. A. Bernard, American Limestone Co., St. Louis, Mo.; Paul Doll, Missouri Limestone Producers Association, Jefferson City, Mo.; Paul Frank, Paul Frank Quarries, North Vernon, Ind.; R. G. Goodrich, Franklin Limestone Co., Nashville, Tenn.; Wm. E. Hewitt, East St. Louis Stone Co., Ill.; Wm. Kearn, Consumers Co., Chicago; K. K. Kinsey, Concrete Materials & Construction Co., Cedar Rapids, Iowa; Worth Merritt, National Stone Co., Joliet, Ill.; F. W. Mumma, Columbia Quarry Co., St. Louis, Mo.; D. S. Pickett, Lehigh Stone Co., Kankakee, Ill.; Norbert Schwarz, Pontiac Stone Co., Pontiac, Ill.; and Lynn Stewart, Columbus, Ind.

The Division's Executive committee accepted the invitation from the National Farm Show management to place an exhibit in free space provided as an educational feature. It was decided that such an exhibit would be in line with policies of the Association "to bring to the attention of the general public and farmers the importance of liming the soil." Cost of the exhibit was financed by voluntary contributions from member companies.

Henry Huschke demonstrating a test to determine whether soil requires limestone

Los Angeles Industrial Minerals Conference

Promote development of Western minerals at Los Angeles section meeting, Industrial Minerals Division, A.S.T.M.

By JAMES A. BARR, Jr.

FOLLOWING the San Francisco non-metallics conference by one day, the Los Angeles section of the Industrial Minerals Division, American Institute of Mining and Metallurgical Engineers, presented West Coast producers of non-metallics a group of papers of special interest and at such a time when there is need to study and develop quickly methods for concentrating industrial minerals of the West Coast area in preference to paying for high costs of transporting sorely needed raw materials from Eastern states.

WALTER B. HEATER, baroid sales division, National Lead Co., Henry Mulryan, Sierra Talc Co., as chairmen, and E. O. Slater, Smith-Emery Co., Dr. Ian Campbell, Western vice-chairmen, Industrial Minerals Division, were congratulated by Dr. J. S. Gillson, chairman, Industrial Minerals Division, for an excellent meeting and a timely program and the untiring efforts of Walter Heater, program chairman.

Comprehensive papers on the following subjects were presented:

"Costs of Prospect Drilling" by G. Austin Schroter, consulting mining engineer and geologist.

"Clay" by F. Leicester Cuthberg, manager of laboratories, Baroid Sales Division, National Lead Co.

"Water as an Industrial Mineral" by Julian A. Hinds, chief engineer, Metropolitan Water District of Southern California.

"Flotation of Non-Metallics" by James A. Barr, Jr., chief metallurgist, Chemical Division, Armour and Co.

"Fertilizer Minerals and Soil Amendments" by Oliver Overseth, exeutive secretary, California Fertilizer Association.

"Pumice as a Lightweight Aggregate" by F. Sommer Schmidt, appraisal mining engineer, Inyokern Naval Reserve.

Non-Metallic Raw Materials

Introductory remarks of JOHN D. SULLIVAN, president of the American Ceramic Society, at the meeting, October 16 and 17, outlined at length our critical raw material situation and emphasized how dependent the ceramic industry is upon our industrial minerals.

His remarks on ceramic materials, construction materials such as concrete and cinder block were so impressive that the Los Angeles Times came out next day with the headline "New Stone Age Predicted by Ceramics Chief."

There must be a more favorable balance between our metal and nonmetal economies in the future, and for this balance we must depend on our relatively inexhaustible non-metallic minerals.

CLYDE E. WILLIAMS, president, American Institute of Mining and Metallurgical Engineers, gave an address at the banquet meeting and urged industry to look to the future through the eyes of research and to concentrate on raw materials from our non-metallic mineral resources for our new and ever changing complex economy.

Glass Sand

Silica sands of high quality are a much needed non-metallic resource in the Western states. A considerable tonnage of pure silica sand is hauled by rail all the way across the continent.

Since the coastal area is becoming so heavily industrialized, it is inevitable that local deposits must be exploited by proper beneficiation methods to produce a consistently high quality sand for the glass, ceramic and foundry industries.

The best deposits contain considerable quantities of feldspar, mica and clay.

Froth flotation will be used to remove these minerals to produce a concentrated silica product as well as a salable feldspar and mica concentrate.

P. C. VALENTINE, sales manager of the Del Monte Properties Co., discussed several sand producing properties, including the Corona and Del Monte sand deposits, under the title, "Sands Produced in California and Their Relation to the Industries They Serve — Comprising the Glass and Foundry Industries." The Corona sand after preparation analyzes 93 per cent SiO_2, 4 per cent Al_2O_3, 3 per cent alkalies and about 0.10 per cent Fe_2O_3. The Del Monte sand is beneficiated by washing, classification, drying and high intensity magnetic separation to produce a product analyzing 82 per cent SiO_2, 11.0 per cent Al_2O_3, 2.0 per cent CaO, 5 per cent alkalies and 0.05 per cent Fe_2O_3.

A good Eastern glass sand contains only 0.02 per cent Fe_2O_3.

Limestone

"Limestone Outcrops in California" were discussed in detail by C. A. LOGAN, district mining engineer, California State Division of Mines.

A brief historical background mentioned the first lime kiln in the state and the early development of the industry.

In 1865, consumption of cement reached 100,000 bbl. per year at $2.50 per bbl. Further production figures include 641,000 bbl. of cement in 1903, while production in 1946 was 19,546,336 bbl. which required about 4,000,000 tons of limestone.

Uses of limestone include: building, smelting, beet sugar refining, agricultural, soil treatment, filler in commercial fertilizers, dry and liquid insecticides, and as a compound of animal foods, poultry grits and chicken food.

Limestone deposits in the northern California, southern Sierra Nevada regions, and the Mohave Desert were described. Indications are that ample supplies of good limestone and dolomite in the State of California are available within reasonable distance by road and rail from the principal consuming centers.

"Calaveras Limestone" was discussed by LEWIS A. PARSONS, Calaveras Cement Co. Details of the Sierra limestone deposits and the adaptability to production of portland cement were given. Mr. Parsons outlined mineral characteristics, specifications, tolerances for magnesian and other diluent minerals, drilling methods for exploration and mining methods and briefly the geology of the ore body.

Refractory Clays

Refractory clays are essential industrial minerals. Kiln and furnace lining requires a brick which will withstand the intense heat of combustion gases.

W. F. DIETRICH in his discussion of "Refractory Clays of California" classified fire clay brick as: Superduty, p.c.e. 33, 3173 deg. F.; High-heat duty, p.c.e. 31-32, 3056-3092 deg. F.; Intermediate-heat duty, p.c.e. 29, 2984 deg. F.; Low-heat duty, p.c.e. 19, 2768 deg. F.

Although there is no immediate shortage of clays for high-heat duty

(Continued on page 134)

FLORIDA LIMESTONE As A Paint Extender

Interesting study of the commercial possibilities of finely ground limestone for use as an extender in paint

By A. L. KIMMEL*
and MACK TYNER*

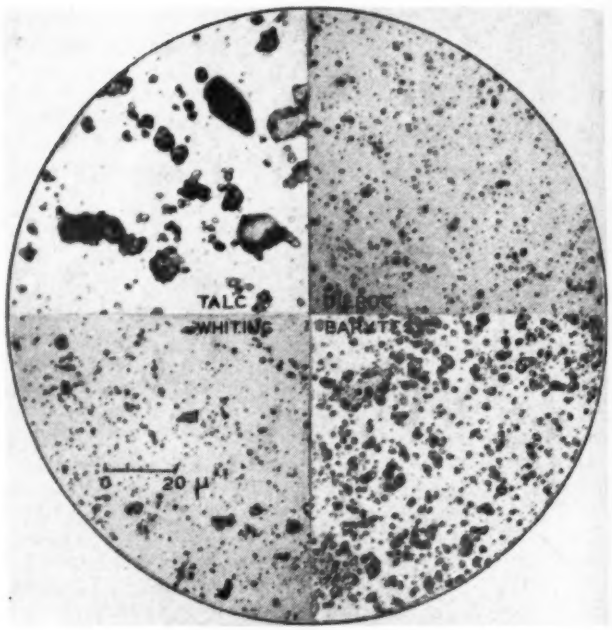


Fig. 5: Photomicrographs of extender pigment made at 100 magnification

INTRODUCTION

• ONE of the most widely used groups of pigments in the paint industry, are those classified as "inert" or "extenders." This group of materials is unique in that all pigments included have approximately the same refractive index as the oils and varnishes used in the manufacture of paints and enamels. When incorporated in oleoresinous or oil vehicles an extender pigment forms a hazy translucent film with little or no covering power, which fact probably accounts for its being designated as an extender or inert. Modern research has definitely established these pigments as a necessary constituent of a commercial paint or enamel and larger quantities of these materials are used each year for this purpose. A few of these pigments are: barytes, talc, diatomaceous silica, Blanc Fixe, and the chalks.

High dry hiding power pigments and flats have been much talked about in recent years. These products as they dry and flat acquire higher hiding power than they possess in the wet state. Some extenders are more efficient than others in the development of high dry hiding power in flat paints. The phenomenon of high dry hiding power is caused by insufficient free binder in the paint so that all pigment-binder surfaces are not covered and the light reflection from the free surfaces contributes substantially to the hiding power of the pigment. The phenomenon is found in both water and oil paints. Under these conditions the extender may contribute considerable hiding power to the paint.

EXTENDER or inert pigments found on the market are processed by a combination of mechanical and chemical operations. In most cases, the methods of processing are very similar and Fig. 1 gives a step by step flow diagram of procedure for the operations on three classes of pigments. The extensive use of extender materials in paints can best be illustrated by sales data compiled by the Bureau of Mines for some of the common extenders. Fig. 2 shows the producer sales of extenders for use in paints from 1936-1944.[1,2] The sales of whiting for use in paint are not listed.

A soft, amorphous limestone occurring in Florida, known locally as limerock, after suitable processing appears to have properties that make it suitable for use as an extender pigment. It occurs as a soft clay-like material with a color ranging from light cream to gray, and is obtained by open pit mining after removing 5 to 15 ft. of overburden. The bulk rock analyzes 98-99 per cent calcium carbonate with small amounts of silica and lesser amounts of iron and clay minerals. It is the purpose of this paper to compare the physical properties of Florida limerock with similar products for use as extender pigments, and to acquaint the paint industry with this new extender material.

Preparation of Dilroc Extender

Every state has its deposits of limestone and most of them utilize the deposits for various purposes. Deposits of limestone are widely distributed in Florida. The principal uses to which this high-calcium limestone are put at present are in building and construction work. Recently it has been shown that finely ground Florida limestone can be used as an inert carrier or diluent in the application of insecticidal dusts.[3] The properties of this finely ground limestone such as low oil adsorption, non-reactivity with linseed oil, and cheapness, suggested its use as an extender pigment in paints. Normal processing operations to make a finely ground extender pigment from Florida limestone would follow the flow diagram for rock pigments in Fig. 1. An engineering comparison of

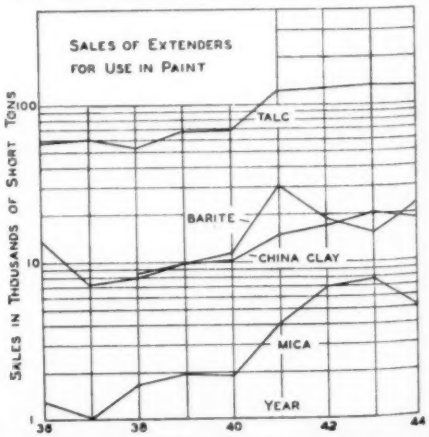


Fig. 2: Paint extenders sold in the United States by producers, by years

[1] Bureau of Mines, Information Circular 7264. "Natural Mineral-Paint Extenders."
[2] Bureau of Mines, Minerals Yearbook, 1944.
[3] M. Tyner, "Dilroc—A New Insecticide Diluent," Agricultural Chemicals, Ap. '47.
[4] C. E. Berry, "Modern Machines for Dry Size Reduction in the Fine Size Range," Ind. and Eng. Chem. 38 pp. 672-678, 1946.
[5] Pulverizing Machinery Company, Summit, N. J.

*Florida Engineering and Industrial Experiment Station, Gainesville, Fla.

TABLE III: RELATIVE RECEPTIVITY OF EXTENDERS TO TINTING

Color	Increasing Order of Receptivity White Tone			Dark Tone
Chrome Yellow	Fla. limestone	Whiting	Talc	Barytes
Chrome Green	Fla. limestone	Whiting	Talc	Barytes
Blue Toner	Whiting	Fla. limestone	Barytes	Talc

modern machines for dry size reduction in the fine size range has been made by Berry.[4]

In the laboratory the natural rock was ground in a laboratory size "Mikro-Atomizer."[5] Air-dried limestone passing the No. 4 screen was fed into the mill and the finely ground product separated in the cyclone. The product thus processed has a weight median diameter of 3.4 microns (by sedimentation) and an oil absorption of 26 lb. oil per 100 lb. extender (A.S. T.M. D 281-31). For convenience this extender pigment is called Dilroc.

The reactivity of extender pigments toward linseed oil is determined by investigating the change of consistency of oil and extender mixtures with age. Mixtures for consistency age tests were made up at a concentration of 10 lb. extender pigment per gallon raw linseed oil (1.08 lbs. extender per lb. oil) and aged one month. The Modified Stormer viscosities are shown in Fig. 3 at the age of 2 and 30 days. There is no evidence of reaction between the extenders and the raw linseed oil (acid No. 2-4) because there was no appreciable change of consistency with age. However, with oils of higher acid number (10-14), it is expected that reaction would occur with Dilroc as with other natural carbonates.

Comparison of Paint Extenders

A. Particle Size: Particle size of extender pigments is important because it affects and may control such factors as consistency and gloss of a paint. The selection of a method for particle size measurement[6] depends on many factors such as the size range of the material, the information desired, the accuracy and speed of operation, etc. A sedimentation method for particle size very similar to A.S. T.M. D 422-39 but modified after Schweyer[7] was used for measuring the particle size distribution of each extender pigment in the comparison. Particle size distribution of each extender studied is shown in Fig. 4. With the data in Fig. 4 one can derive two commonly used measures of particle size: the weight median diameter and the surface mean diameter. These values are tabulated in Table I.

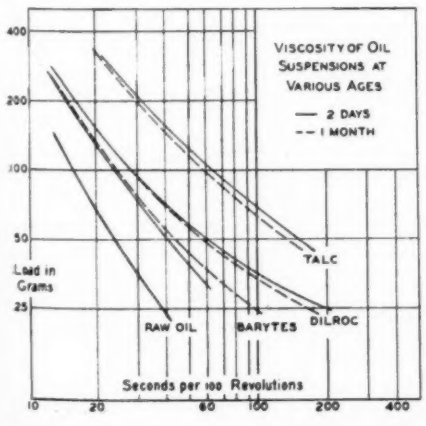


Fig. 3: Test of extender reactivity with raw linseed oil. Modified Stormer viscosities at 25 deg. C. are shown at ages of two and 30 days. Extender concentraton 10 lb. per gal. of oil

TABLE I: PARTICLE SIZE OF EXTENDER PIGMENTS

Material Fla. limestone,	Wt. Median Dia. Microns	Surface Mean Dia. Microns
Dilroc	3.4	2.2
Barytes	8.0	3.4
Whiting	6.7	5.1
Talc	12.0	4.3

The lack of agreement between weight median diameter and surface mean diameter is a good illustration of the fact that the only complete way to describe the particle size of a sample of material in the sub-sieve range is by a particle size distribution curve.

In addition to the particle size distribution each extender was compared as to size, shape, and structure by photomicrographs. Photographs of the extenders made at 1000 *X* are shown in Fig. 5.

B. Covering Power. In any white house paint formulation the covering power of the extender pigment is recognized as very low and of negligible value. However in high-dry-hiding-power paints the extender generally contributes substantially to the hiding power of the paint, so that a determination of the relative covering power of extender pigments in water paints was felt desirable. The covering power of the extender pigments was compared by a brush out method using Krebs Hiding Power charts[8] for standard background. The comparison of extenders was made in casein and methyl cellulose water paints. The

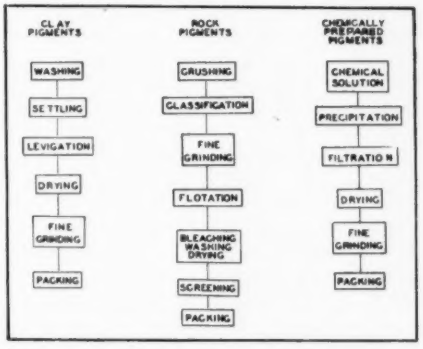


Fig. 1: Flow diagrams for preparation of extender pigments

method consisted of applying successive coats of the paint to the same chart, with drying between coats, until the contrast between black and white stripes on the Krebs Charts was obscured. Then the pounds of extender pigment required to cover 100 sq. ft. of chart is calculated from the gain in weight of the chart and the appropriate conversion factor.

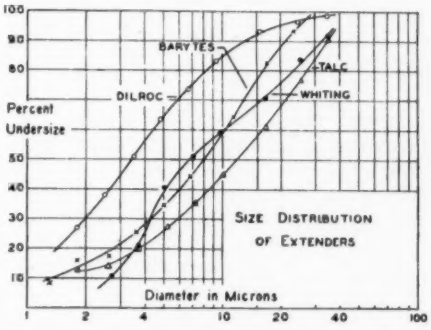


Fig. 4: Particle size distribution of extender pigments tested (by Sedimentation)

The formulation of the paint specimens was as follows:

Methyl Cellulose binder:

Extender pigment	50 parts
Methyl Cellulose (15 cps)	4 parts
Water	110 parts

Casein binder:

Extender pigment	80 parts
Casein (low viscosity)	10 parts
Lime	2 parts
Water	120 parts

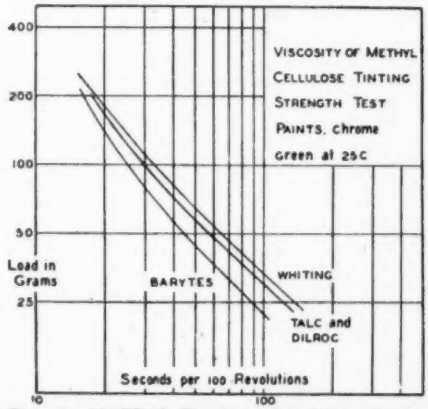

VISCOSITY OF METHYL CELLULOSE TINTING STRENGTH TEST PAINTS, Chrome Green at 25C
BARYTES
WHITING
TALC and DILROC
Load in Grams
Seconds per 100 Revolutions

Fig. 6: Modified Stormer viscosities of the methyl cellulose series of covering power test paints

6 **"Symposium on New Methods for Particle Size Determination in the Sub-sieve Range,"** Washington Spring Meeting of A.S.T.M. March 4, 1941.

7 H. E. Schweyer, Personal Communication. Feb. 20, '47. Also see Schweyer, **Ind. & Eng. Chem., Anal. Ed.** Aug. 5, 1942. "Particle Size Studies, Methods."

8 H. A. Gardner, **"Physical and Chemical Examination of Paints, Etc."** p. 21. 9th Edition, 1939. **Institute of Paint and Varnish Research,** Washington, D. C.

In mixing each batch the binder was completely dispersed in water first, then the extender pigment was added and the paint ground in a laboratory ball mill using ½-in. porcelain balls for one hour to disperse the extender pigment. A small amount of ammonia was used to disperse the casein binder. The paints were ready to use after checking their viscosities. The Modified Stormer viscosities of the methyl cellulose series of paints is shown in Fig. 6.

The results, tabulated in Table II, show that the covering power of these extender pigments in water paints decreases in the order of Florida limestone, whiting, talc, and barytes.

TABLE II: COVERING POWER OF EXTENDER PIGMENT IN WATER PAINTS

Extender	Covering Power, lbs. per 100 sq. ft. Methyl Cellulose	Casein
Florida limestone	3.3	3.7
Whiting	4.2	4.6
Talc	5.6	6.9
Barytes	8.7	9.5

C. Toning Strength: One of the important factors in selection of an extender pigment especially for use with pastel colors is the susceptibility of the extender pigment to toning by colors. Three colors were selected for investigation as being representative of colors as to material and particle size; they were as follows:

1) C. P. Chrome Green Medium No. 3504
2) C. P. Chrome Yellow Medium No. 2213
3) Blue Toner BT-100-D

The method used in this work was to prepare paint samples with methyl cellulose binder and to make films on glass sheets using a Bird Film Applicator. Then the air-dried films were inspected and arranged in their proper order from white to dark tint. With a given color the extender that produces the whitest film is least susceptible to toning with that color.

The formulation of the tinting strength test paints was as follows:

Chrome Green and Chrome Yellow:

Extender pigment	60	parts
Color pigment	10	parts
Binder	6.4	parts
Water	156	parts

Blue Toner

Extender pigment	70	parts
Color pigment	0.7	parts
Binder	6.4	parts
Water	156	parts

In mixing the paints the methyl cellulose binder was completely dispersed in water and the extender, color pigments, and remaining water were added and ground in a laboratory ball mill with ½-in. porcelain balls for 3 hours for dispersion. The viscosities of samples were determined with a Modified Stormer viscosimeter. Typical viscosity curves are shown in Fig. 7 for the Chrome Green sample.

A Bird Film Aplicator drawing a .003-in. film was used for making films on glass plates. The results of examination and arrangement of the films in increasing color are shown in Table III.

No experimental work was done on tint retention for it is well-known that calcium carbonate and calcium sulfate show better tint retention than talcs in house paints[9] and lusterless enamels,[10] and for this reason may be preferred in tinted formulations. In general, tinted paints are more durable than white paints and for this reason extenders may be used with tinted paints that would be considered unsatisfactory in whites.

Conclusions

Experimental data, taken in the Engineering laboratories at the University of Florida, indicate the following:

1. Florida limestones can be made into an extender pigment by suitable mechanical operations without difficulty and at a reasonable cost.

2. Covering power and tinting studies indicate that this material has a higher dry capacity than most commercial pigments.

3. The Florida limestone pigments show very little oil reactivity over long periods of time.

4. Since this material is light cream in color it could find wide use in pastel colors for inside water paint, white and colored outside paints, and in roof and railroad paints.

It is believed, by the authors, that this material can be processed and sold in the south at a substantial saving to southern paint manufacturers. The economy of the operations are now being studied.

[9] W. G. Vanney, **"House Paint Extenders,"** Official Digest, Federation of Paint and Varnish Production Clubs, p. 1-13, Dec. 1945.

[10] S. E. Beck, **"Durability of Lusterless Enamels," Ind. Eng. Chem. 35, 594, 1943.**

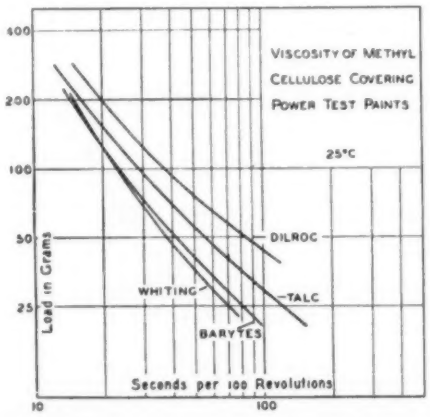


Fig. 7: Modified Stormer viscosities of tinting strength test paints (chrome green pigment)

Fluorite, Feldspar Reports

TWO SEPARATE reports describing wartime investigations of fluorite and feldspar deposits in Texas and Utah have been released by the Bureau of Mines. The first is entitled "Blue Bell Fluorite Deposits, Beaver County, Utah," and the second, "Badu Feldspar Deposit, Llano County, Texas." Both may be obtained free by writing to the Bureau of Mines, Department of the Interior, Washington 25, D. C.

Agstone Use in Illinois

WITH THE AMOUNT of agstone (ground limestone, dolomite, and marl) used for soil improvement in Illinois during 1946 totaling more than 5,350,000 tons, the state continued to rank first among the 48 in the use of liming materials for soil treatment.

Based on reports of producers to the Illinois State Geological Survey, this was 1,068,000 tons more than was used in 1945, or 25 per cent above the 1945 level, establishing a new high record. During 1946 agstone was produced in 47 of the 102 counties of the State. Of the total agstone used during the year, 92.7 per cent was produced in Illinois.

Talc, Soapstone Mine Production at New High

MINE PRODUCTION of talc, pyrophyllite, and ground soapstone reached a new high in 1946 as did the quantity and value of these commodities sold or used. Total imports were greater in both quantity and value due to the larger amounts of ground materials brought in. Exports of "talc, steatite, soapstone, and pyrophyllite, crude and ground" also showed an increase in quantity and value, while exports of "powder—talcum (in packages), face, and compact" were over a million dollars higher in value in 1946 than in 1945. New York was still the leading producing state by a considerable margin, with North Carolina in second place. These facts are based on Mineral Market Report No. 1544, Bureau of Mines.

Runaway Tug Accident

PIONEER SCOW No. 10, owned and operated by Pioneer Sand & Gravel Co., Seattle, Wash., was overturned and sunk when rammed by a runaway tug that had been abandoned by its crew when it caught fire. The owners, in bringing suit against the city, claimed damage to the scow amounting to $20,000 and complete loss of a load of gravel valued at $1,000.

AMERICAN ROCKWOOL CORPORATION, Chicago, Ill., has purchased the wartime detinning plant on Vanderbilt Road in Birmingham, Ala., and will convert it for rockwool manufacture.

Turntable Speeds Up Return of Quarry Trucks

By L. A. CASTELL

TWO YEARS AGO, the J. L. Shiely Co., St. Paul, Minn., secured a contract from the Northern Pacific Railway to supply 1,000,000 cu. yd. of hard rock ballast over a ten-year period. This figures out to an average daily delivery of twenty 70-cu. yd. cars, or 1400 cu. yd. a day during the ballasting season, which runs from about May 20 to October 1. To maintain this average, it is necessary to build up a stockpile of about 25,000 cu. yd. before the season opens; and speedy, efficient operation thereafter is of extreme importance.

At the time the order was placed, the Shiely Co. had already in use at its St. Cloud quarry (from which the ballast is coming) a 42-in. crusher and four haulage units. This equipment proved adequate until this year. But the hauls over the two-year period were becoming longer. To keep the crusher supplied to capacity, as well as to keep operating costs down, larger vehicles were needed.

Albert R. Shiely discussed the problem with his General Superintendent, Tom Harrison. It was decided to purchase three new Euclid 15-ton trucks with special, over-sized quarry bodies. A new 3½-cu. yd. Lima shovel (Diesel) was also acquired to step up the job. The purchase of the Euclids, however, raised a new problem. These trucks needed a turning radius of about 64 ft. A ramp almost 200 ft. long leads up to the crusher. This ramp has an 8 per cent gradient, and is about 25 ft. high. On one side of the crusher is a quarry pool 60 ft. deep. On the other side is a stock pile. To back the Euclids up this ramp was not only hazardous, but slow. The best speed in the backing operation that could be attained with safety was about two miles per hour. To move the crusher meant an expense of $20,000. The most feasible alternative was to put in a road around the quarry pool to enable the trucks to turn around, but this would still have involved backing them up about 100 ft. It was at this point that Mr. Harrison thought of installing a turntable which would eliminate all backing.

Turntable installations on docks and trestles are not new, but Mr. Harrison's idea of using compressed air for operating this quarry turntable is distinctly interesting. Part of the existing equipment at the St. Cloud quarry was an old-type Ingersoll-Rand tugger hoist. This 2½-hp. air hoist had a 1000 line pull at 80 lbs. air pressure. This was to supply the motive power for the turntable.

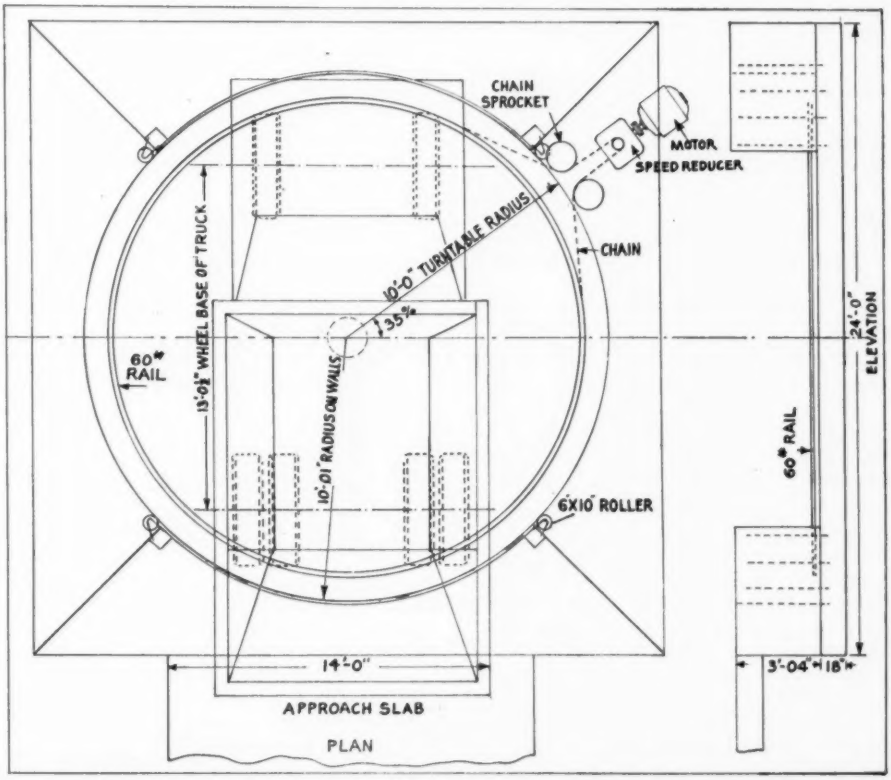
The table, made to order by the St. Paul Foundry Co., was installed last March. It has a radius of 10 ft., and accommodates one truck at a time. The rails were built in two semi-circular halves, and all that had to be done to assemble it on the site was a little welding and bolting the framework together. The table rests on a solid concrete foundation, and 8-in. timbers form the decking. It weighs about 6 tons light, about 36 tons with truck and load. The total cost, installed, was $3,800.

The truck drives up the ramp on to the table, is turned in 15 seconds, dumps its load, and drives off down the ramp. The turning speed of the circumference of the table is about 85 ft. per minute. The net saving is two minutes per truck-load, or two hours per truck on a ten-hour shift. Mr. Shiely estimates that the table saves the operation of one truck. In addition, the wear and tear on transmissions caused by shifting gears and backing is eliminated, as well as the hazard to truck and driver in backing up so long a ramp. No additional help to operate the table is needed. The same employe who operates the feeder also operates the turntable.

As stated before, the turntable was installed last March and has been operating continuously since then. "We made only two changes," Mr. Harrison said, "First, we found it necessary to replace the air hoist. It was thirty years old; and after making some 15,000 turns, it finally wore out. We decided to replace it with an electric motor, partly because we were not intending to replace the hoist; but any quarry which doesn't want to get a motor and speed reducer can use an air hoist. We replaced it with a 5-hp. motor connected to a speed reducer which drives a chain sprocket engaging an endless link chain which runs completely around the upper rail of the turntable. Two 10-in. sprockets are used at the turns, one of which is mounted on a pivoted arm, and connected to a 500-lb. tension spring which keeps the slack taut in the chain. Second, we added 6- x 10-in. rollers. When the trucks moved on and off the table, some back-lash was experienced; so we installed the rollers at each corner of the foundation abutment to take up this back-lash. They act as a rolling buffer. No other changes were necessary, and the table has been operating very satisfactorily. We are well-pleased with the table, and the drivers are enthusiastic about it. They have practically no backing up to do on the job now, except for a few feet at the shovel."

The table has been inspected by several visitors a week from other operating ballast plants and quarries.

The Northern Pacific Railway plans to re-ballast its entire main line. It is the first of the western roads to make such a change to hard rock ballast. Eastern railroads have been using it almost exclusively; but in the West, the ballast has been essentially gravel.



Plan and elevation details of truck turntable which may be operated either with air hoist or electric motor

Future for HYDRAULIC CEMENTS

Something might be learned from a study of natural and artificial hydraulic limes

By NATHAN C. ROCKWOOD

THAT HYDRAULIC LIMES and lesser known hydraulic cements have a future in this country has long been a firm conviction of the writer. That their development has been so long delayed is something to speculate about, since there has been considerable research and much experimenting with mortar cements generally, most of which are still compounded of portland cement with more or less secret ingredients. The purchaser, at least, is seldom allowed to know just what they are composed of.

On the other hand hydraulic limes and similar cements are among the most ancient and honorable mortar and concrete materials, and proof of their durability is shown in many structures both in this country and more particularly abroad where their manufacture was long continued. Occasionally some one has raised his voice, or used his pen, to remind American manufacturers of the possibilities in making other products than portland cements and "fat" limes. The late Robert Lesley was one. He occasionally bemoaned the fact that when portland cement manufacture was introduced into this country, producers lost all interest in other kinds of hydraulic cements, while on the other hand in France and elsewhere in Europe research concerning manufacture of hydraulic limes and other "special" cements continued.

With some of the shortcomings of present-day portland cements so definitely established, the wonder is all the greater that researchers and manufacturers do not look more into the causes of permanency and other long-tested good qualities of hydraulic limes. Some experts who ought to know, say the difference between hardened portland cement and hardened hydraulic lime is in the nature of the calcium silicates formed. The lower grade (monocalcium?) silicate formed in hydraulic lime is apparently the only lasting kind of a calcium silicate. At least it is the only kind that has survived in nature's own rocks.

It is assumed that when portland cement hardens, the lime and silica as a hydrated silicate do combine in some lower lime-silica ratio than occurs in the clinker. In the hydrated cement, according to Lea and Desch (The Chemistry of Cement and Concrete, p. 150), the ratio of lime to silica is between 1.5 to 1 and 2 to 1. Also, there is reason to believe that these are not stable combinations and continue to free more lime as they age. The absence or rarity of such high ratio calcium-silicates in nature ought to be prime evidence that they are not stable (permanent), while rocks in which the lime-silica ratio is unity or less than unity are stable.

It would seem, therefore, to laymen like us, that research for a permanent hydraulic cementing material would be directed toward avoiding a cement that is known to hydrate into unstable compounds. However, research and "progress" in portland cement manufacture has been in the opposite direction. For 25 years or more it has been directed toward loading the raw mixture for portland cement manufacture with more and more lime, and harder burning, with the objective of forming a clinker having a maximum of tricalcium silicate. Obviously, the farther a hydrated portland cement departs from a 1.5 or 2 to 1 lime-silica ratio toward higher ratios, the more unstable it must be so far as keeping its lime in combined form.

Very likely, the chemical explanation of the difference between hardened portland cements of high and low lime-silica ratios is not so simple as stated, because the nature of the silicates formed in hydrated cements may actually be of quite different properties according to the alkalinity of the solutions in which they are hydrating and hardening. There is known to be a large number of possible combinations of hydrated lime and silica, and it surely would not be stretching the imagination to say that some must be much more stable than others. Yet where can we find any research on calcium silicates in hydraulic cements in which the lime to silica ratio is unity or less than unity?

Hydraulic Limes vs. Portland Cement

The most illuminating definitions of lime and cements we know of were given by Platzmann (ROCK PRODUCTS, November 15, 1924), although after an exhaustive research in the foreign literature on the subject he admits there is considerable confusion over the definitions. However, for this discussion we may accept his approximate compositions as follows:

	CaO (and MgO) after burning	Clay content SiO_2, Al_2O_3 Etc.	Water content after slaking
Quicklime	90 to 100	0 to 10	25 to 26
Weakly Hydraulic Lime	85 to 90	10 to 15	20 to 24
Strongly Hydraulic Lime	65 to 85	15 to 35	17 to 22
Roman Cement	55 to 60	40 to 45	.....
Portland Cement	60 to 65	35 to 40	

The fundamental difference between the methods of manufacture of limes and natural cements, and of portland cements, is that the limes and natural cements are burned at lower than sintering temperatures, and portland cements above. We know very definitely that limestones burned at excessively high temperatures make limes that tend to be inert—they are exceedingly slow slaking or hydrating and usually make coarse hydrates—in other words they do not thoroughly hydrate. On the other hand limes are more chemically active and hydrate more readily the lower the temperature of calcination. Therefore, when we hydrate a mildly-burned hydraulic lime, action between the lime and the silica begins at once to form the monocalcium silicate, or perhaps a hydrated silicate with a lime-silica ratio less than unity.

Hydraulic limes were originally made to be hydrated on the job and used as other limes are used. In order to meet the demand for a bagged product that could be used at once with water without soaking, one or two American manufacturers make a hydrated hydraulic lime, in which the hydration is carried out only sufficiently to reduce the product to a

powder, leaving some of the silicate unhydrated until used on the job. It is not known whether or not this results in a hardened hydraulic lime of the same character as those long used in Europe. Our guess would be that it would more nearly approach the ancient article if it were prepared and shipped as pulverized lime and not as hydrated lime; for the heat of hydration must certainly be an important factor in forming the permanent lime-silica combinations, and most of this has been lost in "hydrated hydraulic lime"; but we are not so sure that the hydrated product really contains free lime; maybe it is a hydrated low ratio lime-silicate since the usual tests for "free" lime would not show the difference.

Let's see what combinations could be formed between the lime and silica at normal temperatures in the course of time, with say an hydraulic lime containing 70 per cent lime and 30 per cent SiO_2 + Al_2O_3 + Fe_2O_3, the approximate molecular weights of which are: CaO = 48; SiO_2 = 60; Al_2O_3 = 102; Fe_2O_3 = 160. Assume we have 20 per cent SiO_2; 6 per cent Al_2O_3 and 4 per cent Fe_2O_3. We then have by weight 3360 CaO to combine with 1200 parts SiO_2 + 612 Al_2O_3 + 640 Fe_2O_3, or an excess of 908 parts of CaO, if a single molecule entered into each combination. However, at temperatures of approximately 1800 to 2000 deg. F., to which an hydraulic limestone is burned, the CaO combines more readily with the Al_2O_3 and Fe_2O_3 in approximately a 2 to 1 ratio or greater, than with the SiO_2, so that the 1250 parts of Al_2O_3 + Fe_2O_3 would require something like 2500 parts of CaO, leaving a calcium silicate with about a lime-silica ratio of unity or slightly less. When these compounds are hydrated there would be no lime left over in the hydrated products, and apparently none left in the unstable higher ratios of lime-silicates such as are found in hydrated portland cements.

It appears, however, when portland cements are hydrated, the dicalcium and tricalcium silicates, according to Lea and Desch, form 3 CaO 2 SiO_2 + x H_2O + $Ca(OH)_2$. As much as 17 per cent of the lime in the original clinker, in high-limed cements, may be set free as hydrated lime, in addition to the lime combined with the silica in the unstable 3:2 or 1½ to 1 ratio.

Concrete for Permanence!

If our analysis and reasoning are correct, it is not difficult to see why hydraulic lime mortars (and in ancient days, concrete) are really permanent, and some portland cement concrete of the last 30 years is anything but. However, we could hardly be expected to go back to the days of hydraulic limes, as they were then made, for concrete, because they did have many disadvantages measured by present requirements. They were very slow in hardening and in gaining strength—a matter of months and years perhaps instead of days and weeks; their ultimate strengths may have been considerably less, but no tests exist to prove this. Some hydraulic limes may have been unsound for reasons that could now be avoided. It must be remembered that the calcination of hydraulic limestones was rather haphazard and without the controls possible today.

The advantages of hydraulic lime mortars, in addition to their time-proved permanency, are that they have more plasticity than portland-cement mixes, usually have greater yields, are not so sensitive to water-cement ratios, are lighter in weight, and hence go farther, pound for pound (about 60 lb. per cu. ft., against 94 lb.), and probably change less in volume in setting and hardening.

No one knows what could be done with artificial mixtures designed to make the ideally perfect hydraulic lime, burned at low enough temperatures to make the most reactive product, and pulverized to finenesses comparable to those of present-day portland cements. It is true, of course, that the slow hardening and slow gain in strength are very serious handicaps to the use for concrete of any hydraulic lime we now know about. This presents a research problem, perhaps no more serious than that of developing "high limed and highly sintered" portland cement mixtures to get quick-hardening concretes. The research might be for an accelerating agent which would not be harmful to the finished concrete. The lime industry has already done something along this line—use of a calcium chloride solution for example.

Artificial Hydraulic Limes?

The question is raised can we have such a product as an "artificial" hydraulic lime? If so what distinguishes it from a Roman or puzzolana cement made with hydrated lime and a pulverized puzzolana? We have in this country a good example of a masonry cement (it has been used successfully for concrete, too) made of hydrated lime and pulverized slag which has puzzolanic properties. What is it? Probably it is nearer a Roman cement than anything else, but if we understand how Roman cement was made in the days of the Romans, the pulverized puzzolana was mixed with quicklime and the mixture hydrated on the job, which would avoid losing the reactive heat of hydration. This certainly would not only help but probably hasten the set. Thus Roman cements were more like true hydraulic limes than present puzzolana cements.

There is another process of making a puzzolana cement which is used by two or three American manufacturers, in which quicklime and a prepared puzzolana are hydrated together, and subsequently ground to cement fineness. At least one manufacturer adds a small percentage of portland cement clinker to provide for earlier hardening and greater tensile strength. Perhaps this could be classified as an artificial hydrated hydraulic lime, but the cement clinker in hydrating would still form the 1½ lime to 1 silica calcium-silicate. However, the presence of an excess of the puzzolana might be helpful in the eventual hardening process by combining with this excess of lime from the hydrated clinker.

What then is a mixture of portland cement and hydrated lime now much used for mortar cement? If the portland cement is the modern kind composed chiefly of dicalcium and tricalcium silicates, which hydrate to unstable 1½ to 1 lime-silica ratios with an excess of lime left over, it does not appear that the addition of more hydrated lime without also adding a puzzolana can do much more than add the physical properties of plasticity and water retentiveness. It probably does not change for the better the nature of the silicates formed in the hardened mortar.

There is a theory, however, proposed by Tippmann over 30 years ago, which has never been accepted by cement experts, that the sole virtue in hardened portland cement; that is, its strength-giving property, lies in the interlaced needle-like crystals of calcium hydroxide (hydrated lime, $Ca(OH)_2$). According to his theory the function of the calcium and aluminum silicate gels and the pulverized gypsum during hydration and hardening is to create favorable conditions for crystallizing the $Ca(OH)_2$. Unless these conditions are right, the $Ca(OH)_2$ is freed as amorphous hydrate and in that form is not only useless, but a detriment to the mortar or concrete, because in its liberation as amorphous hydrate it expands in volume, while in the crystal form it does not. He found the same reaction (forming of crystals) could be obtained with the lime and gypsum alone. While cement researchers have not pursued this theory, there is no reason why lime researchers should not. This theory would explain why estrich (hard-burned) gypsum cement also has lasting properties.

There remains the possibility of mixing and burning at comparatively low temperatures mixtures of limestone and argillaceous materials in proportions to make an hydraulic lime rather than portland cement clinker. The problem would be one of so intimately mixing them that the necessary reaction would take place without clinkering or "incipient" fusion or actual fusion. It should be simple with a wet process, for the mix in portland cement manufacture does apparently ball up before reaching the clinkering stage. It could probably be done by making compressed pellets and burning them in a rotary kiln if

they are small, or in shaft kilns if the balls or pellets are made large enough. Possibly such a process would require a temporary binder of some kind to keep the pellets from disintegrating.

Markets for Hydraulic Lime

Whether any one can be found with sufficient curiosity to do some research on the possibility of making artificial hydraulic lime or not, there are hundreds of deposits of impure or argillaceous limestones (the old-time "water limes") suitable for the manufacture of natural hydraulic limes. Such limestones may be so high in magnesium carbonate as to be ruled out for portland cement manufacture, but that is no handicap to their use for making hydraulic lime. Indeed it is an advantage if the rock is properly burned—that is, not over-burned.

A good, genuine hydraulic lime, on the strength of its centuries of successful use for most of the world's great monumental buildings of the past, ought to be comparatively easy to reëstablish in the present-day market for mortar cements. Its composition is known and can be made public; if it hardens to low ratio lime-silica calcium silicates of great durability, as seems to be the case, its virtues can be proclaimed from the house-tops. No arguments would be needed to prove its workability, plasticity and sand-carrying capacity, without the addition of artificial "plasticizers."

Manufacturers of hydraulic lime would have a really sound argument for its use with portland cement in concrete. Instead of adding more free hydrated lime to concrete that already has an excess, it would provide at least some of those very desirable, stable calcium-silicates, having lime-silica ratios of unity or less than unity. In other words, it would serve the purpose of a sure-fire puzzolana.

Future of Portland Cement

Probably most serious-minded manufacturers of portland cement appreciate that there is something wrong with the present-day product. True, it is vastly superior to the earlier product in many ways; but in the achievement of making a concrete that can be guaranteed to last any given number of years, even under known local conditions, there is still room for much progress. When great dams are made by the laborious earthfill method, which surely should have been constructed of concrete but were not because the builders are losing faith in concrete, it is time to take a fresh look at cement and concrete research of the last quarter century.

We do not believe the whole answer is in the use of air-entraining agents, although they unquestionably are helpful to present-day cements and may be essential in all future ones. To us it seems that the chief thing to find out is what are the unstable lime-silica components of hardened cement and what makes them unstable. Probably the presence of soluble alkalies in the concrete helps, but lime appears to be associated with such disintegration, too. It has been proved to the satisfaction of some engineers that certain kinds of reactive siliceous coarse aggregate make cement (or concrete) unsound or unstable. Why do they react more with some cements than others? It seems that the alkalies, excluding the free lime, are not always to blame. Is it the free hydrated lime, and the additional lime freed at later ages by the breaking down of the 1½ to 1 ratios in lime-silica silicates? If the monocalcium silicate is the only stable and desirable one, how are we going about it to make cement that will have this and not those with higher lime-silica ratios?

It seems to us that researchers in portland cement problems are too much concerned with what happened last month or last year and not enough interested in what happened 100 or 1000 years ago, when by some crude method producers were able to build monumental structures of satisfactory concretes. For jobs that require speed and are not intended to last too long, such as most structural concrete, maybe the present-day portland cements are the answer; but for pavements and massive hydraulic works designed to serve indefinitely, it would seem something better could be developed. It is convenient to have a concrete pavement opened to traffic 30 days or less after it is completed, but if it is a choice of waiting 90 days or longer and having a pavement that will last 50 or 100 years as against one that is cracked up after 20 years, we would hazard a guess that the longer waiting period for a slower hardening concrete would be the most economical.

Portland cement manufacturers as well as some engineer users are now showing a bit of interest in puzzolana additions or substitutions in portland cements. If enough puzzolana is added to take care of the 15 or 17 per cent of hydrated lime freed in the hydration process, it will help. But if the rest of the hardened cement is composed mainly of hydrated dicalcium and tricalcium silicates with lime-silica ratios 1½ to 1 and more, we still have unstable ingredients in the hardened concrete. Whether the puzzolana will remain active enough, or there is enough of it, in the hardened concrete, after a period of years, to combine with the lime thus being freed at later ages is evidently unknown. Maybe if this reaction should take place after the concrete has thoroughly hardened it would be a cause of disintegration.

Although addition or substitution of puzzolanas in portland cements is probably a step in the right direction, it would appear that it is at best merely an attempt to correct a product already made, with which something is fundamentally wrong. If it is the low-ratio lime-silica silicates that are desired, which the puzzolanas help in some measure to supply, why not try to make them in the hydrated cement? To have active puzzolanas, the argillaceous materials (shales, clay and silicates) must be calcined at relatively low temperatures. At high temperatures such as those required to make present-day portland cements, they are rendered inert. Therefore, merely adding siliceous materials to a portland cement raw mix would not necessarily be the whole answer. We would have to go back to burning temperatures short of "incipient fusion," or burn the puzzolana in separate kilns and grind it with the clinker.

Effect of Natural Cement Blends

The division of physical research of the Public Roads Administration has recently issued a report on "The Effects on Properties of Concrete of Natural and Portland Cement Blends" (*Public Roads*, December, 1947), which we interpret as something like confirmation of the theory expounded above, although the authors, A. G. Timms, W. E. Grieb and George Werner, draw no such conclusions. We believe that the chief advantage of adding natural cement to portland cement comes from the fact that natural cement hydrates to form some monocalcium silicate, since such cements are burned at lower temperatures than portland cement and usually contain a larger percentage of argillaceous minerals, and magnesia. All of the old-time authorities agree that the magnesia is helpful in hydraulic cements if it is not "dead-burned," as is bound to be the case of magnesia in portland cements.

The Public Roads Administration's conclusions are these:

"1. Blends containing the nonair-entraining natural cements had higher strengths than blends of air-entraining natural cements at all ages of test.

"2. For all combinations the strengths of the concretes were inversely proportional to the air contents.

"3. The blends of the slag cement with each of the three portland cements had equal or higher strengths at one year than the same portland cements without blending.

"4. There were no outstanding differences in the drying shrinkage characteristics of concretes made with any of the cement combinations tested.

"5. Greatly increased resistance to freezing and thawing in water was obtained with the air-entraining portland cements and with the blends which produced relatively high air contents in concrete.

"6. In the interrupted cycles of freezing and thawing in water, only those concretes having relatively high

air contents had sufficient resistance to disintegration to survive, as indicated by a drop in N^2 of less than 25 percent in the first phase of 60 cycles. After a further storage period of 128 days in water these same high-air concretes developed further resistance as indicated by a recovery of N^2 that surpassed the initial reading at the start of the first phase. In the subsequent freezing and thawing (second phase) they showed better resistance than they did at 60 cycles in the first phase.

"7. Under continued moist curing, concretes with the lower percentages of entrained air absorbed their maximum capacity for water; those containing high percentages of air did not, but the voids filled with water after the drying and boiling treatment.

"8. In practically all cases, the bottoms of the cores gave better resistance to freezing and thawing in calcium chloride solution than the tops. The air-entraining portland cements and in general the natural cement blends gave better resistance than the plain portland cements."

National Crushed Stone Association Convention Program

NATIONAL CRUSHED STONE ASSOCIATION will hold its 31st annual convention, January 26-28 in Cincinnati, Ohio, featuring a number of prominent speakers from the industry and related fields.

The program will open on Monday morning, January 26, with greetings from the association president, G. A. AUSTIN, who will also report on business conditions during 1947 and the outlook for 1948, prepared on the basis of information submitted by the regional vice-presidents.

Other reports will be given by A. T. GOLDBECK, engineering director; J. E. GRAY, field engineer, and J. R. BOYD, administrative director. Presentation of safety awards will be made by F. J. BUFFINGTON, safety engineer, of the New York Trap Rock Corporation, and chairman of the cement and quarry section of the National Safety Council.

A paper entitled "The Work and Unit Plan" will conclude the morning session, and will be presented by ROBERT W. WATT, manager, publicity and research department of the New Jersey Manufacturers' Association. The Greeting Luncheon will follow with HONORABLE JAMES E. STEWART, former mayor of Cincinnati, and currently a justice of the Ohio State Supreme Court, as guest speaker.

Monday afternoon's session will be devoted to operating men and equipment manufacturers and will be opened by a paper entitled, "Churn Drill Exploration," by J. R. THOENEN, chief, Tuscaloosa division, Mining branch, United States Bureau of Mines, at University, Alabama. General discussion will follow based on a selected group of topics submitted by operating men in advance of the convention.

Formal inspection of the Manufacturers' Division Exposition, preceded by a cocktail party and buffet supper, will be held from 7:30 until 10:30 p.m. Monday.

Three formal presentations have been scheduled for Tuesday morning's meeting, including papers on "The Effect of Aggregates on the Durability of Concrete," and "Selecting Your Salesmen." Remaining time will be given over to the annual business meeting, including reports of committees, election of officers and board of directors, and greetings from the president-elect.

The Manufacturers' Division will hold its annual business meeting at lunch Tuesday, with the rest of the afternoon being left free for further inspection of the Manufacturers' Division Exposition. A special meeting will be held that evening for all delegates interested in accident prevention.

On Wednesday morning, the session will be devoted entirely to operating men and equipment manufacturers and will consist of a panel discussion on the topic "Delayed Action Blasting." DR. L. DON LEET will open the discussion, and JULES E. JENKINS, Vibration Measurement Engineers; HAROLD WILLIAMS, attorney, Boston, Mass.; L. F. MILLER, New York Trap Rock Corporation; and representatives of the manufacturers of explosives who are members of the Manufacturers' Division, will be the speakers.

JUDGE R. V. FLETCHER, special counsel of the Association of American Railroads, will address the general luncheon on Wednesday, his topic to be "The Crisis in Railroad Transportation."

Speakers to appear at the afternoon program on Wednesday include: FRED SWINEFORE, engineering director, Macadam Pavements, Inc., Columbus, Ohio, on "The Modern Macadam Road"; and JOHN C. GALL, on "Labor-Management Relations Act of 1947." A paper will be presented on "Revised Interpretations Under the Wage-Hour Law and Their Significance with Respect to the Taft-Hartley Act."

Convention activities will be brought to a close Wednesday evening with the customary reception for everyone in attendance. This will follow the 31st annual banquet of the National Crushed Stone Association and the 3rd annual banquet of the Agricultural Limestone Division at which HONORABLE JOSH LEE, former United States Senator from Oklahoma and currently a member of the Civil Aeronautics Board, will be the speaker. His talk, although it will have serious aspects, will predominate on the humorous side.

Agstone Division

THE THIRD ANNUAL CONVENTION of the Agricultural Limestone Division, National Crushed Stone Association, will be held January 29-30 at the Netherland Plaza Hotel, Cincinnati, Ohio. Seven speakers have been chosen to address the delegates including TOM KELLY, the "chalkie-talkie" man who will chalk-talk about the subject "There's More to Dirt Than Meets the Eye" at the Greeting Luncheon on Monday. CHARLES F. BRANNAN, assistant secretary of agriculture, will speak at Tuesday's luncheon on the long-range farm program which has been recommended for congressional action by the U. S. Department of Agriculture.

The other speakers will be DR. C. E. BREHM, acting president of the University of Tennessee, on "What Is Ahead for the Farmer"; ROBERT H. ENGLE, of the National Fertilizer Association, on the use of movies in educational work; DR. ROBERT E. YODER, of the Ohio Agricultural Experiment Station, on "Liming Ohio Soils"; W. C. JOHNSTONE, of the Kentucky Agricultural Experiment Station, on "The Use of Limestone in Soil Improvement"; and JUDD C. BENSON, of the Union Central Life Insurance Co., on "Selling in a Competitive Market."

Cement Production

BUREAU OF MINES reports that production of finished portland cement during August, 1947, totaled 17,480,000 bbl. or 8 per cent greater than that reported for August, 1946. Mill shipments reached 20,362,000 bbl. in August, 1947, a figure 13 per cent above that reported for August of the previous year. Stocks of finished portland cement on August 31 were 10,455,000 bbl., an increase of 12 per cent over that reported for August, 1946. Demand for cement was higher than in August of last year in all but one district.

The following statement gives the relation of production to capacity, and is compared with the estimated capacity at the close of August, 1947, and August, 1946.

RATIO (PER CENT) OF PRODUCTION TO CAPACITY

	Aug. 1947	Aug. 1946	July 1947	June 1947	May 1947
The month	86.0	79.0	80.0	81.0	66.0
12 months	75.0	59.0	75.0	74.0	74.0

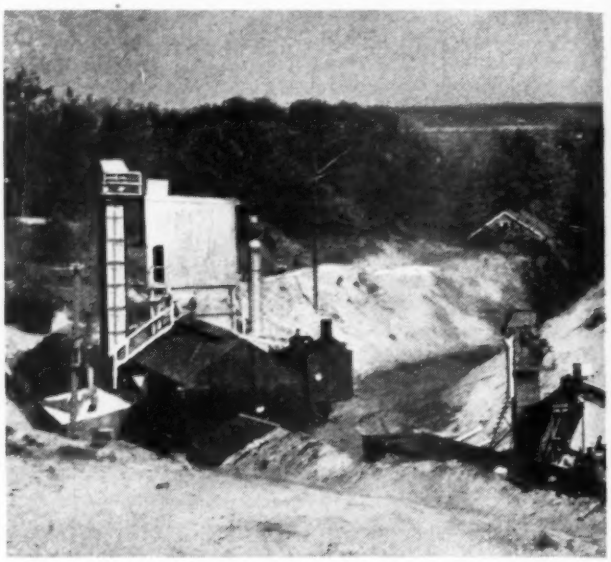
Reopen Rock Quarry

EMMETT MATHES, Eagleville, Mo., is reopening a limestone quarry near Ridgeway for the production of agricultural limestone and crushed stone. The quarry was formerly operated by the Soil Conservation Service.

CORE SAND Dried and Screened with Modern Equipment

Standard Sand Co., Benton Harbor, Mich., builds compact plant near Grand Haven, Mich., with unusual electrical system for all operations

By RALPH S. TORGERSON



Looking down at core sand drying and screening plant. To the right may be seen the screen and elevator with spout for loading wet sand direct to cars

ABOUT a year ago S. E. Doster and Joel G. Pearson took over the Baker Sand Co., Grand Haven, Mich., and started a program of modernization and expansion which is now approaching completion. The company is now known as the Standard Sand Co., with executive offices in Benton Harbor, Mich.

Neither Mr. Doster or Mr. Pearson had any experience in the operation of a core sand plant, but both were successful business men. Mr. Doster is the owner of a foundry business and head of one of the most aggressive insurance agencies in southern Michigan. Mr. Pearson is president of Pearson Construction Co., which has been very active in the construction contracting business, and during the war built many military and industrial structures.

The recently completed plant has several innovations in design and equipment, and in the words of other foundry sand men who have inspected the property, it has one of the "best screening arrangements and drying plants in the country."

The deposit is a sand dune rising to a height of 150 ft. and covers a good portion of the 40-acre tract owned by the company. It has an excellent gradation meeting most core sand specifications, and is remarkably clean. The supply of material is almost inexhaustible as considerable sand is blown in to replace material which has been excavated.

Excavation is comparatively simple. A Koehring shovel equipped with a ¾-cu. yd. clamshell bucket loads a 10-cu. yd. steel field hopper, with steep sloping sides, at the bottom of which is a steel feeder built to the company's own design. This feeder comprises two reciprocating steel push rods operated by chain drive from the tail shaft of the belt conveyor.

To the right may be seen the belt conveyor inclining up from field hopper to screen from which sand goes either to the plant by underground belt conveyor or to the elevator for car loading; screening and drying plant, to the left

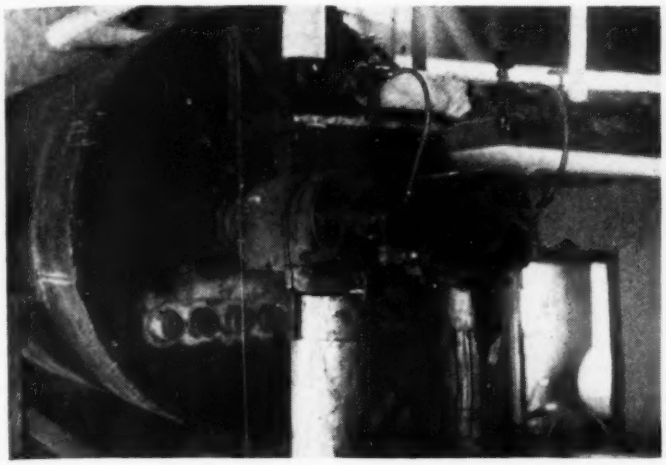
The 24-in. belt conveyor, 100 ft. centers, inclines up to a superstructure supporting a 4- x 12-ft. Bonded Scale Co. single deck vibrating screen with ¼- x 1¼-in. slotted screen cloth. A 10-hp. Baldor motor drives the screen.

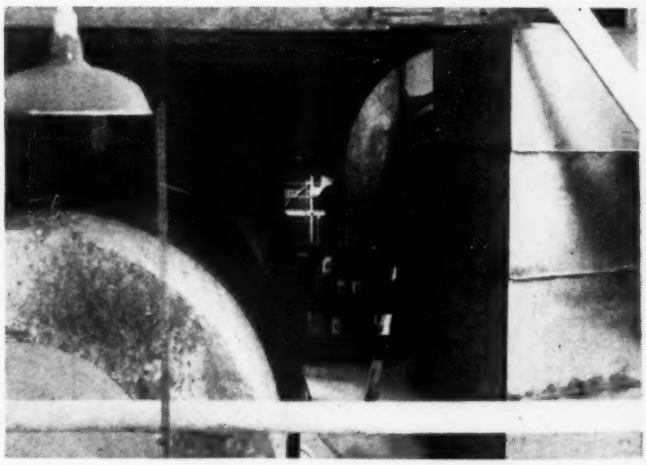
Wet Sand Plant

This screen serves to remove trash and other foreign materials, and also intimately mixes the sand. Trash rolls to the bottom of the screen where it falls into a chute, and is diverted to one side where it is out of the way and can be pushed aside by the DT9 International crawler tractor equipped with a bulldozer or otherwise disposed of. Sand passing the screen falls to another hopper having a pants leg chute with a gate controlled by a screw that permits diversion either to the boot of an elevator, 25 ft. centers, for loading open top freight cars direct or to a horizontal belt conveyor in a tunnel which extends under the track siding to the drying and screening plant. The screen and elevator set-up has a capacity of 65 tons an hour, and supplies a "wet" core sand for those foundries that have their own drying facilities. Westinghouse push-button controls operate screen, elevator, and conveyor. A Grand Rapids Industrial Electric Co. circuit breaker permits shutting off all current for these units when men are working on the elevator or other equipment, and the electrical system also is inter-connected with the main control switchboard in the drying plant so that operations can be shut off from that location.

Drying and Screening Plant

The railroad siding of the Pere Marquette R.R. extends into the property of the company with drying and screening plant along one side and the deposit and carloading elevator on



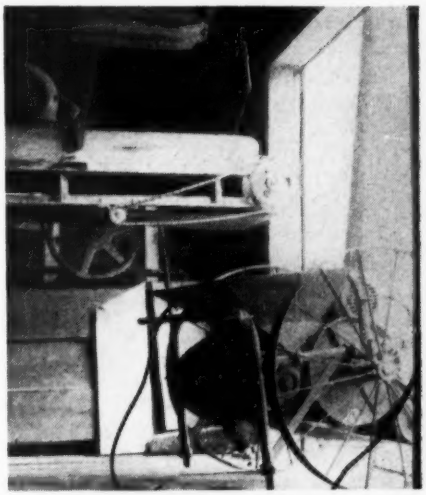


Left: Twin nozzle oil burner installation on dryer. Right: Rotary dryer, to the left, and cooler fan and duct, to the right

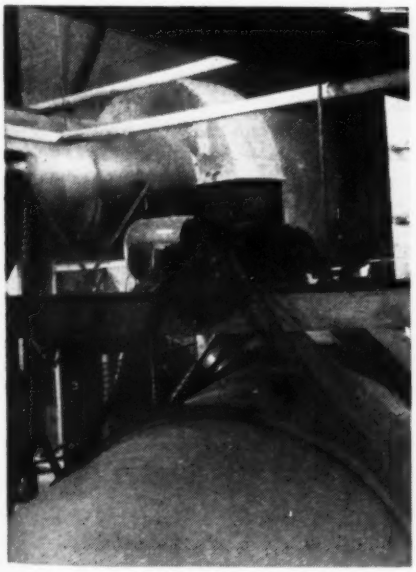
the other side. At present a 25-ton Ohio locomotive steam crane is used to pull cars from the siding to the main line with the aid of the International bulldozer to push cars, but a Fridy electric car puller hoist spots the cars while loading.

Sand to be dried and screened is moved by the 24-in. tunnel conveyor, approximately 65 ft. long, to the boot of No. 2 elevator, 75 ft. centers, alongside the plant with a chute to the 6- x 30-ft. McDermott Bros. rotary oil-fired dryer which has a capacity of 65 t.p.h. The dryer is driven at 7 r.p.m. by a 20-hp. Allis-Chalmers electric motor through a D. O. James speed reducer and ring gear.

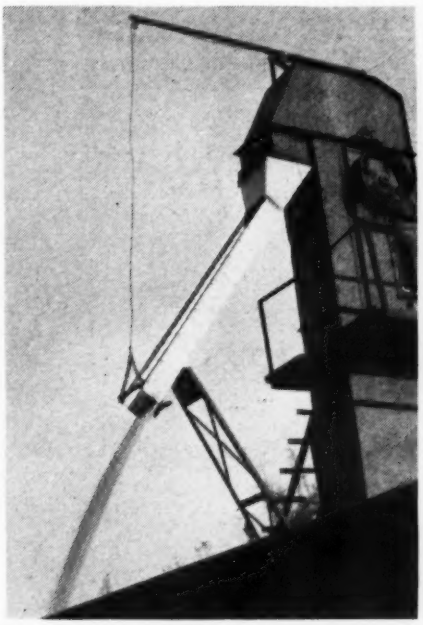
The firing chamber of the dryer, 4-ft. in diameter and 10-ft. long, is lined with fire brick. A twin Volcano Specialties oil burner under 15 lbs. pressure fires the dryer with a heavy oil, No. 5 or No. 3, which is preheated for the oil burner. The dryer exhausts through a stack extending through the roof with a blower fan creating a draft. In the boiler room is a 15-hp. Gibbons boiler fired by a Hev-E oil burner that heats the oil for dryer oil burner and will also supply heat for the No. 1 outside carloading elevator. This elevator is to be housed in an enclosure constructed of concrete block. Two Fairbanks, Morse automatically-controlled pumps circulate 180 gal. of oil per hour through the heating coils to the dryer burner. A Brown electric pyrometer near the oil burner charts the temperature of the sand as it leaves the dryer and is chuted direct to the cooler. The 6- x 20-ft. rotary cooler, designed by the company, is driven at 7 r.p.m. by a 10-hp. G.E. motor through a 3:1 V-belt reduction to an Eaton 5-ton truck axle with a 6:2 reduction and thence to a chain driving a segmental gear around the cooler. The drive assembly, electric motor and Eaton axle, is supported above the cooler by steel I-beams forming an H frame. Air is



End of portable carloading conveyor with sand thrower to the right



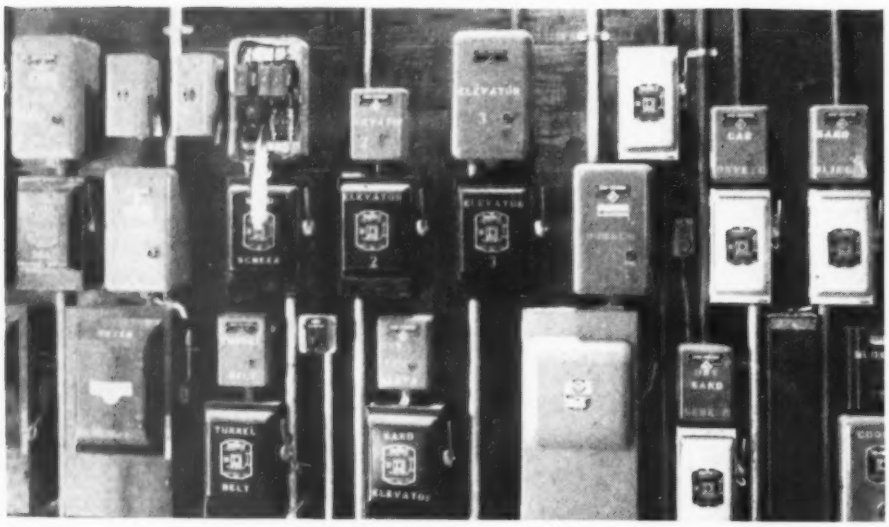
In the background may be seen the firing chamber of rotary dryer with dried sand passing by chute direct to cooler. Note cooler drive supported on I-beams with chain driving segmental gear



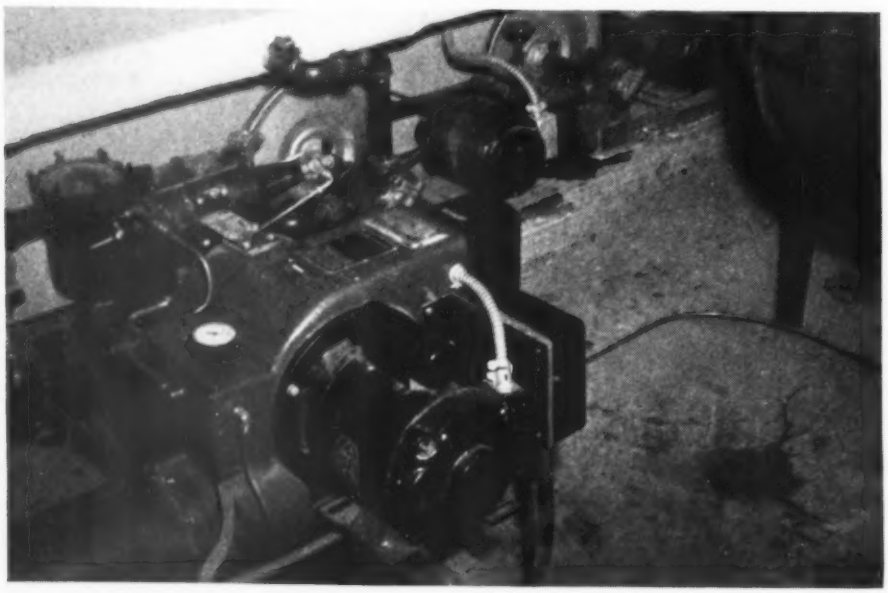
Hinged chute raised into position by pulleys and cable to load sand into cars from elevator

Showing conveyor feeding screen, the sand passing by pants leg chute from hopper to elevator or to tunnel conveyor

Showing a portion of sand deposit over 150 ft. high



Electrical control panel showing switch and automatic circuit breaker units for nearly every major piece of equipment with interlocking circuits equipment preceding point to shut down of trouble



In the background are the two motor-driven pumps to circulate oil through heating coils to the dryer oil burner. The oil burner for the plant boiler is shown in the left, foreground

drawn through the cooler by an American Sirroco No. 6 exhaust fan exhausting through a duct connected at the feed end to a stack extending through the roof to the outside.

Sand flowing through the end of the cooler goes to the boot of the No. 3 elevator which elevates it 55 ft. to the top of the plant where it is again screened over a single-deck 4- x 8-ft. Simplicity screen with ⅛-in. screen cloth. Sand passing the screen falls to a 150-ton steel bin having provision for three separate compartments, but only one gradation of dried sand is now stored.

Below the bins are three lever-operated gates controlling the flow of sand to a portable horizontal belt conveyor. This conveyor is on a platform so that it may be moved forward through a doorway and project into a box car door and be withdrawn when not in use. A Stephens-Adamson Sinden portable box car loader in the car throws the sand to either end of the car. It also is possible to load cars direct from bins by means of a flexible hose extending down the outside of the plant. All dried sand contains less than one per cent moisture and is free of organic material.

Electrical Control System

The electrical control system of this plant is somewhat unusual. Power is supplied to the plant transformer station at 7200 a.-c., and is stepped down to 480 volts which is the voltage used for all motors. Screens and elevators have 10-hp. motors.

At one end of the plant is the switch and circuit breaker control panel. Each switch control is plainly lettered with the name of the equipment which it operates, and the circuits are so designed that should any piece of equipment be shut down due to failure or trouble of any kind, the screens, conveyors, elevators, etc., preceding this unit also would be shut down. There are also convenient switch controls at other points in the plant so that equipment can be shut down without going to the main switch control panel. One of these switch locations is near the firing end of the dryer so that the man in charge controls operations preceding the dryer. The outside carloading elevator, screen, and tunnel conveyor also may be controlled from the plant switch control panel. Control equipment was supplied by Allis-Chalmers, Square D and Cutler-Hammer.

In addition to foundry sand, the Standard Sand Co. sells a large volume of engine sand to the railroads.

Seven men operate the plant with Fred Showers in charge as superintendent. Joel G. Pearson, one of the partners in the enterprise, supervised the construction work at the plant, and is in general charge of operations, and sales are in charge of S. E. Doster with headquarters at Pearson Construction Co., Benton Harbor, Mich.

LABOR RELATIONS TRENDS

Prospective Changes in Wage and Hour Law

By NATHAN C. ROCKWOOD

A U. S. HOUSE OF REPRESENTATIVES labor subcommittee has been holding public hearings and is investigating the possibility for desirable changes in the Fair Labor Standards Act, otherwise known as the Wage and Hour Law. Not much publicity has attended these hearings, presumably because of the precedence given the Marshall Plan for aid to Europe and other headline news. Nevertheless, revision of the F.L.S.A. is of utmost importance to all American employers, to many of whom its administration has been more of a headache than that of the National Labor Relations Act (Wagner Act) which was revised last summer by the passage over the President's veto of the Labor-Management Relations Act.

The recent Portal-to-Portal Act did correct some of the worse administrative interpretations of the F.L.S.A., but there remain many more points which need clarification by legislation. It is to discover and correct these that the subcommittee is now at work. It has been announced that no action will be taken during the present special session of Congress, but the matter may come up at the regular session after the first of the year, if the majority party has the nerve to tackle it in an election year. While the formal public hearings have now ended, in all probability, Congressmen would welcome bona fide data on employers' experience with the F.L.S.A. and constructive suggestions for its revision.

Better Definition of Coverage

Some of the most absurd situations have arisen over attempts by the F.L.S.A. administrators and the courts to differentiate between employes in *inter*-state and those in *intra*-state commerce. Quite naturally, bureaucrats in the office of the administrator have consistently sought to embrace more and more territory, as is always the case; and their efforts, with the help of the courts, have been quite successful in progressively stretching the coverage beyond the anticipations of many employers, and very possibly of Congress. Another prime cause of employer headaches is the attempt to distinguish between employes who are covered by the law and those who are not by virtue of their executive, administrative or professional jobs.

So far as known, there are no statistics of the millions of dollars for which employers have been victimized by disgruntled ex-employes in claims for unpaid overtime based wholly on time records allegedly kept by the employe himself, in many cases for overtime of which the employer was blissfully ignorant. However, it is apparent from the testimony before the subcommittee by the most recent ex-administrator that his agents took it upon themselves to seek out such cases and to use whatever official prestige they could muster to persuade employers to make settlements, which the courts might or might not have held them accountable for. In many such cases it would seem that the payments were made as the easiest way to get rid of a nuisance rather than from any sense of obligation to the employe or ex-employe.

Changes Asked

The extreme interpretations of the meaning of "regular rates" of pay and their inclusion in overtime rates have been the cause of many employer difficulties, and very likely a prime reason why some employers have dropped profit-sharing bonuses, and other forms of incentive wages. The courts have consistently ruled that in most instances such extra compensation must be considered part of the "regular rate" and any overtime must be at one-and-one-half times this *irregular* rate, not the regular rate without the bonus, as the employer intended. As in the case of the Wagner Act, the labor unions' national officers in their zeal to get the best of employers have themselves brought about a need for clarification and probable narrowing of the application of the Wage and Hour Act. The unions have declared for revision insofar as increasing the minimum wage from 40¢ to 75¢ per hour, but they want no other changes made.

Representatives of industry and business have in general asked for a narrowing of the application of the law, which as most employers now know has been stretched to include practically everyone except employes of small local retail and service establishments, that by no stretch of the administrator's imagination can be held to be in "interstate commerce" activities. Among the representatives of industry to testify was Vincent P. Ahearn, executive secretary, National Sand and Gravel Association and National Ready-Mixed Concrete Association, who called to the attention of the committee members, the Associations' experience with the F.L.S.A. administrator in the matter of producers of local materials for local construction, who are now held to be covered by the Act because the structure (highway, railway, etc.) may be an instrument of interstate commerce. The administrator insists upon this interpretation in spite of defeat in a typical case in a U. S. Circuit Court of Appeals, in which Mr. Ahearn's associations took an active part as friend of the court.

That is only one of many borderline cases. By the same kind of reasoning the administrator holds that agricultural limestone producers who furnish material to farms, where the crops subsequently are sold interstate, are covered by the law. Even in the same industrial or business establishment, the administrator has attempted to separate employes, a part of whose duties require unpacking materials from out the state, or handling mail orders to outside the state, from employes who sell retail behind the counter. Our readers are familiar too with the inclusion of building service employes when a certain small percentage of the building's tenants happen to be engaged in interstate business. In all these instances the administrator of F.L.S.A. and the courts have attempted to establish fine distinctions, because the Act itself lacks definite terminology.

That the Act could be more sanely interpreted without congressional revision was demonstrated in its early years under the administration of Maj. Gen. Philip B. Fleming, who was a former army engineer officer and an experienced administrator. But, Gen. Fleming's philosophy is the reverse of that of his successors, as shown in the following question and answer: Rep. McConnell (chairman of the subcommittee): "Would you like to see it (the trend to include as many people as possible under some type of government regulation) reversed?" Gen. Fleming: "I would like to see it reversed." Not so, however, Gen. Fleming's more youthful and inexperienced successor, L. Metcalfe Walling, who proved a rather unsatisfactory witness insofar as getting constructive suggestions are concerned. From the printed record, he does not appear to have answered many questions put to him by the committee with straightforward answers. Yet he was the administrator for five years—much longer than any other incumbent.

Mr. Walling's chief suggestion was that the wording of the F.L.S.A. be changed to read all industry and business activities "affecting" interstate commerce. He failed to make it clear to the committee, apparently, and he certainly doesn't clarify the law to the employer, by this suggestion. Obviously, practically everyone engages in some activity that "affects" interstate commerce, even if we merely smoke a cigar. However, in the same breath Mr. Walling did say that a business establishment should either be all in or all out from under the Act, because it is impracticable to have some employes in and others out, all within the same establishment. His solution, however, would apparently be to have them all under the Act.

For solving the problem of defining "executive" and "administrative" employes, who are exempt from the F.L.S.A., a number of suggestions were

(Continued on page 143)

To What FINENESS Should Cement Be Ground?

Studies of both high-early strength and normal portland cement have been made to determine gain or loss of cementing values in concrete from extreme fines in finely ground cement

By S. L. MEYERS*

A HIGH-EARLY STRENGTH portland cement attains its increase of hardening-rate, as compared to normal portland by either having a higher content of the quick-hardening compound tricalcium silicate or by an increased surface area: The increase of surface area is accompanied by a decrease in the size of the average cement particle and an increase in the number of particles of very small diameter.

It has been the cause of speculation that the particles of very small diameter will be hydrated, in the presence of water, in the mixer to such an extent as to lose much of their cementing value. If such is the case, there is a limit of fineness of particle size of cement beyond which it is detrimental to grind. The following experiments were performed with the object of determining whether or not common practice of grinding high-early strength cements had reached such a limit and, if not, whether such a limit probably exists.

TABLE 1: CHEMICAL AND PHYSICAL PROPERTIES AND PARTICLE SIZE DISTRIBUTION OF CEMENTS USED IN LONG-TIME MIXING TESTS

CHEMICAL ANALYSES	Normal Cement	High-Early Cement
Silica	21.53	20.87 (percent-
Alumina	5.02	5.16 ages)
Iron oxide	2.84	2.84
Calcium oxide	64.65	64.30
Magnesia oxide	2.24	2.10
Sulphur trioxide	1.94	2.57
Ignition loss	0.97	1.32
Insoluble residue	0.15	0.19
Potash	0.40	0.39
Soda	0.22	0.20
Total of above	99.96	99.94
Free lime	0.69	0.62
CALCULATED COMPOUNDS		
Tetracalcium alumino ferrite	8.50	8.50
Tricalcium aluminate	8.50	9.00
Dicalcium silicate	22.00	18.00
Tricalcium silicate	53.00	56.00
Calcium sulphate, as $CaSO_4$	3.30	4.40
PHYSICAL TEST RESULTS		
Normal consistency	25.0%	29.0%
Premature stiffening (Bur. Rec.)	none	none
Initial set (Gillmore)	3 hr., 30 min.	3 hr., no min.
Final set	6 hr., 10 min.	6 hr., 15 min.
Autoclave expansion	0.03%	0.02%
Tension, 1C: 3S, p.s.i.		
24-hr.	—	328
3-days	307	448
7-days	393	532
28-days	408	603
Compression, 1C:2.75, p.s.i		
24-hr.	—	1992
3-days	1900	3608
7-days	3008	4917
28-days	4950	6100
FINENESS AND PARTICLE SIZE DISTRIBUTION	(Percentages finer than a given micron size)	
Micron size		
74 (200-mesh sieve)	97.5	99.9+
60 (325-mesh sieve)	86.5	99.7
55	84.3	99.7
50	82.7	99.7
45	77.6	97.0
40	75.1	95.8
35	68.9	92.7
30	61.2	89.5
25	53.7	83.7
20	46.2	72.7
15	36.6	58.3
10	26.8	43.9
7.5	21.2	35.5
Specific surface, (Wagner)	1700 cm/gram	2570 cm/gram

(Particle size distribution calculated from microampere readings obtained in Wagner method.)

All Chemical analyses in this experiment made by O. P. Kroeger.
All Physical tests made by L. R. Indermuehle.

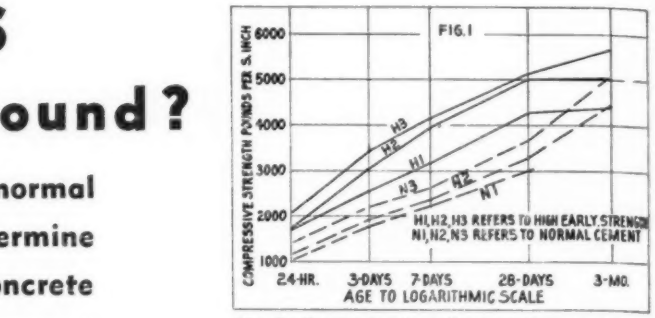


Fig. 1: Graph showing effect of time of mixing on strength of concrete cylinders

Mixing Time

In common practice, mixes of medium size, medium consistency, and with no excess of very large aggregate, the mixing time is about 1½ min. It is generally agreed that mixing times longer than this slightly increases the plasticity and the compressive strength while, at the same time, it reduces the slump of the wet concrete. In looking through the literature for reports on long-time mixing, as in tests on ready-mixed concrete, nearly all the observers agree on an increase of plasticity and a decrease of slump with time of mixing (or time of haul). Some report practically no increase of strength and others report increases of strength up to 50 per cent.

Some specifications limit the mixing time of concrete to 1½ hours; that is, the concrete must be discharged from the truck-mixer or agitator within 1½ hours after the introduction of the mixing-water to the cement and the aggregates.

Concrete Materials

Accordingly, to determine as near as possible the effects of an increase of small diameter cement particles when mixed for varying lengths of time, a mix was designed from the kind of materials that could be separated after hardening by mechanical and chemical means, so that the chemical analyses of the hardened cement paste, which had been freed from the aggregates, could be interpreted and the degree of hydration of the cement in the paste known for the different ages tested. To this end, mixes consisted of all acid-insoluble aggregates,

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sandstone for coarse, and 20- to 30-mesh Ottawa sand for fine aggregate. In one batch of concrete, normal cement with a relatively low surface area was used, while high-early strength, with a relatively high surface area, was used in the other batch.

The mixes were agitated for 15 min., one hour and three hours, including the time required to transfer and mold concrete into cylinders. Samples of the matrix of the wet concrete were taken at these different periods, screened through a 48-mesh sieve onto a hot plate, dried to no visible moisture and placed in bottles within an oven at 200 deg. F. Drying was aided by using air, which had been dried by bubbling through concentrated sulphuric acid and then passed over quick lime, to remove moisture from the samples to that condition where only, practically, non-evaporable water existed in the dried cement or cement pastes. No further hydration could be expected in a sample treated in this manner and chemical tests could be performed on it at any time without fear of it having changed its composition or properties on standing, if kept in air-tight containers. One objection to this method of removing all evaporable water is that a heat of wetting correction is required in heat of hydration tests.

As soon as the concrete cylinders had quit bleeding and the surface water evaporated, they were capped with neat cement and covered with machined plates. At 24 hours they were removed from the molds, stored in a moist atmosphere at 70 deg. F. until the time of test. After the specimens had been broken in a compression test, the matrix was separated from the coarse aggregate by hammer and hand, then the matrix was rubbed in a mortar to separate the cement paste from the 20-30 quartz sand, then sieved through a 48-mesh sieve and dried as above to remove all evaporable water.

During mixing of the concrete there was a great reduction of slump with time. The concrete strengths on the longer mixing periods specimens appeared unreasonably high and the tests on the cement pastes showed a great deal of insoluble residue. It was felt that these conditions were, at least in part, due to the absorptive and friable sandstone, used as coarse aggregate, causing loss of mixing water resulting in rapid stiffening, and the wearing off of small particles of sandstone by grinding action in the mixer. Therefore, the tests using sandstone as aggregate were discontinued.

Silex grinding pebbles, ½ in. to 1 in. in diameter, having practically no wear or absorption, were substituted for the friable sandstone in the next mixes. However, some grinding action still occurred. In addition, some insoluble was formed in separating the hardened cement pastes from the matrix containing 20-30 sand. To reduce the effect of grinding action while in the mixer, the mixer was only run ½ minute in every two minutes.

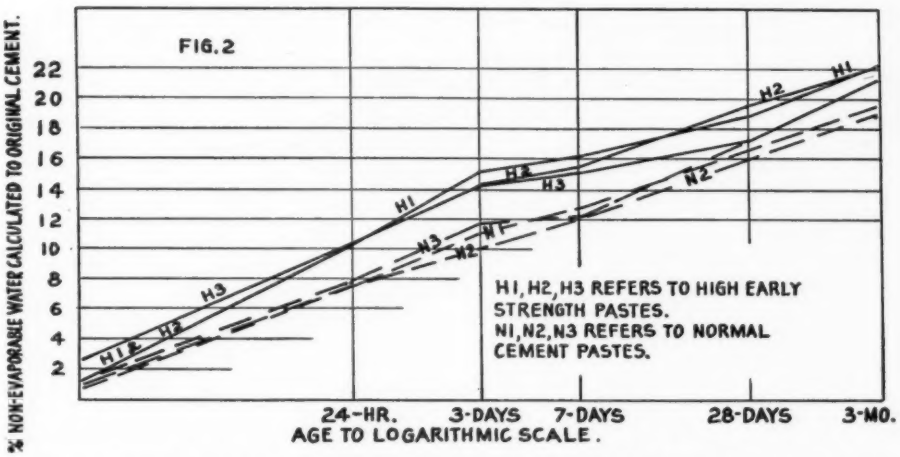


Fig. 2: Curves indicating non-evaporable water in cement pastes taken from concrete cylinders

For both mixes the cement factor was six sacks per cu. yd. For mixing water, 5.8 gal./sack was used with the normal cement and 6.3 gal./sack with the high-early strength cement. The mixer was fitted with an air-tight lid to minimize evaporation losses while mixing.

The following table shows some of the characteristics of the wet concrete:

	Normal cement concrete			HES cement concrete		
Reference No.	N1	N2	N3	H1	H2	H3
Mixing and molding time	13-min.	1-hr.	3-hr.	15-min.	1-hr.	3-hr.
Temperature of room, ° F.	73	74	78	74	71	73
Temp. concrete in mixer, ° F.	73	73	75	75	74½	75½
Slump in inches	7½	7	3	8½	7	2¾
Plasticity	fair	good	good	good	good	good
Bleeding in molds	slight	none	none	slight	none	excellent

(Taking into account the weight of each mix component, its specific heat and temperature, the mean temperature of all the materials in the batch before mixing was 71 deg. F. in each case.)

Slump and Plasticity

Grinding action during the mixing periods produces more aggregate fines in the mix (note the increase of insoluble residue in Mixer Samples, Table 2), and probably increases the surface area of the cement in the mixer, as well as removing hydrated surfaces from the grains of cement, allowing thereby, exposure of new anhydrous surfaces to be hydrated. The increase of fixed (non-evaporable) water in mixer samples is shown in Table 2, but in addition, some of the evaporable water (not shown in Table 2) is immobilized by wetting the new surfaces developed and is loosely bound by any cement gel produced by hydration during mixing.

The increase of fixed and immobilized water reduces the mobile or lubricating water in the mix resulting in lower slumps with time of mixing. The plasticity (also the workability, if the mixing time is not too long and the slump reduced too far) of the concrete is exhibited by water-retention, lack of segregation, and increased fatness of mix. The reduction of mobile water with longer mixing times might also be partly responsible for the increase of strength with mixing time.

The slight rise in temperature during mixing would also have a very slight effect in reducing slump. Owing to the conditions of the test; i.e., dense aggregates and covered mixer, very little mobile water would be lost by absorption to aggregates or by evaporation.

Types of Cements Used in Concrete

Table 1 shows the chemical and physical properties of the two cements. Both cements are ground from similar clinker. The one main point of chemical difference is the sulphur trioxide content which is considerably higher in the HES* cement than in the normal cement. Both cements have about the same tricalcium aluminate content. During hydration more calcium sulphoaluminate will be formed before the gypsum is depleted in the HES cement than in the normal cement: This should help control a high rate of heat evolution during the early hydrating[1] in spite of the higher fineness of the HES cement.

An increase of calcium sulphoaluminate tends to increase crystalline at the expense of colloidal products, resulting in some reduction of the specific surface of the hardened paste and the adsorbed surface water, which is one molecule thick, while the ratio between the surface water and non-evaporable water is probably also changed.[2]

*High-early strength cement

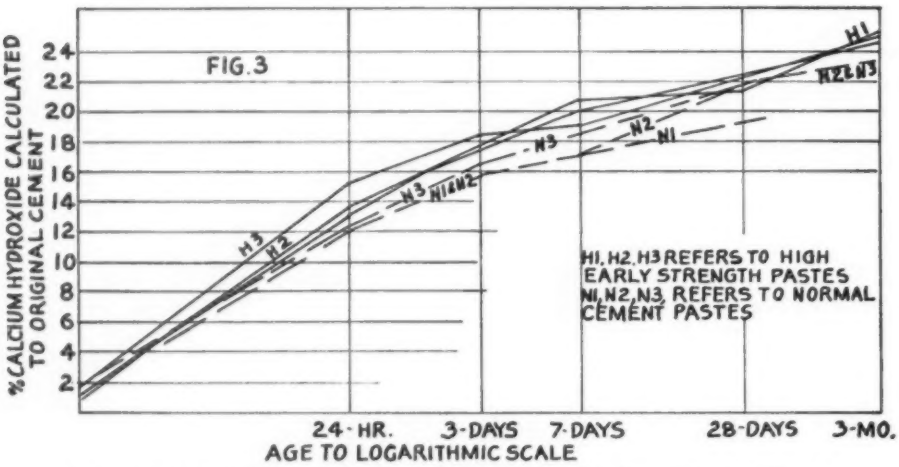


Fig. 3: Hydrolyzed calcium hydroxide in cement paste taken from concrete cylinders

In the particles size distribution, or separation, it will be seen that in the case of the high-early strength cement the percentages finer than a given micron size are much greater than in the case of the normal cement. For example, the minus 7.5 micron size being almost one and three-fourths as great.

Compressive Strength

Table 4 shows a considerable gain of strength with length of mixing time. Hydration would proceed in the wet concrete with time alone and without mixing, probably at a slower rate, but mixing is an aid to prevent the concrete from stiffening too rapidly and becoming unplaceable.[3] The hydrated material produced in the mixer probably contributes as much as usual towards concrete strength, if it can be compacted into a coherent mass into place. Only hydration that precedes a disturbance of the initial structure of the hardening concrete without subsequent compaction will be valueless to contribute to concrete strength. A similar example is in the freezing of concrete; if concrete is frozen while still soft so that when the ice crystals melt the concrete will reconsolidate, little harm will be done, but if the concrete has already partly hardened frost action will disturb the initial structure and it will not consolidate later, resulting in harm to the concrete.

The gain in strength with time of mixing might not be as great an advantage as it appears at first: While the plasticity increased with mixing time, the consistency as indicated by slump, decreased, and to get equal placeability of the concrete under some conditions, an increase of mixing water might be necessary for the long-time mixed concrete N3 and H3 as compared to N1 and H1.

TABLE 3: VOLUME CHANGES ON SHORT AND LONG TIME MIXING PERIODS OF MORTAR BARS

Mix, 1 cement : 4 sand : w/c 0.73 by weight

	Mixed quickly and molded at once		Mixed for 3-hours, then molded	
	Normal cement	High-Early cement	Normal cement	High-Early cement
AIR STORAGE	(% changes in length of bar)			
One day	—.030	—.032	—.033	—.027
Seven days	—.052	—.073	—.067	—.081
28-days	—.056	—.080	—.067	—.101
3-months	—.055	—.080	—.067	—.105
WATER STORAGE				
One day	+.002	+.002	+.002	+.000
Seven days	+.007	+.005	+.002	+.005
28-days	+.011	+.008	+.009	+.008
3-months	+.014	+.008	+.010	+.008
10% SODIUM SULPHATE STORAGE				
One day	+.007	+.005	+.003	+.004
Seven days	+.019	+.013	+.010	+.013
28-days	+.040	+.028	+.027	+.031
3-months	+.094	+.098	+.078	+.273*
Average Thermal Coefficient of Expansion to 3-months, moist air storage	0.0000080	0.0000080	0.0000082	0.000083

*This high figure might have been partly caused by evaporation of the solution below the top of these bars resulting in a high concentration of salt crystals?

TABLE 4: EFFECT OF LENGTH OF MIXING TIME ON COMPRESSIVE STRENGTH

Kind of cement..	TYPE I, NORMAL					TYPE III, HIGH-EARLY STRENGTH				
Reference No.	N1	N2	N3	%gain	%gain	H1	H2	H3	%gain	%gain
Mixing and molding time ..	13-min.	1-hr.	3-hr.	N2/N1	N3/N1	15-min.	1-hr.	3-hr.	H2/H1	H3/H1
Age at Test, p.s.i.										
24-hours	1005	1178	1412	17.2	40.4	1711	1762	2073	3.0	12.1
3-days	1785	1915	2215	7.3	12.4	2570	3075	3456	16.4	34.5
7-days	2256	2534	2821	11.2	12.5	3191	3943	4164	23.6	30.5
28-days	3075	3350	3696	8.9	20.2	4239	4976	5088	17.4	20.0
3-months		4617	5170			4855	5000	5680	14.8	30.4

Each result is an average of three test cylinders, except only one cylinder each for N2 and N3 at 3-months. No N1 at 3-months.

Size of concrete cylinders, 4½ x 5 in.: These had been previously calibrated against 6 x 12-in. cylinders, using the same concrete mix, and a correction factor obtained.

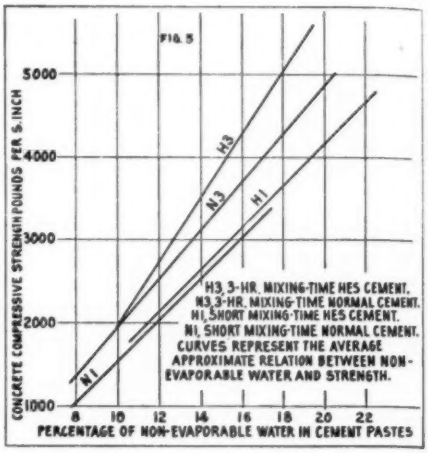


FIG. 5
CONCRETE COMPRESSIVE STRENGTH POUNDS PER S. INCH
H3, 3-HR. MIXING-TIME HES CEMENT.
N3, 3-HR. MIXING-TIME NORMAL CEMENT.
H1, SHORT MIXING-TIME HES CEMENT.
N1, SHORT MIXING-TIME NORMAL CEMENT.
CURVES REPRESENT THE AVERAGE APPROXIMATE RELATION BETWEEN NON-EVAPORABLE WATER AND STRENGTH.
PERCENTAGE OF NON-EVAPORABLE WATER IN CEMENT PASTES

Fig. 5: Relation between non-evaporable water content of cement pastes and compressive strength

Rate and Extent of Hydration

Portland cement concrete reacts with water to form hydration products: Accompanying this reaction are physical changes such as reduction in

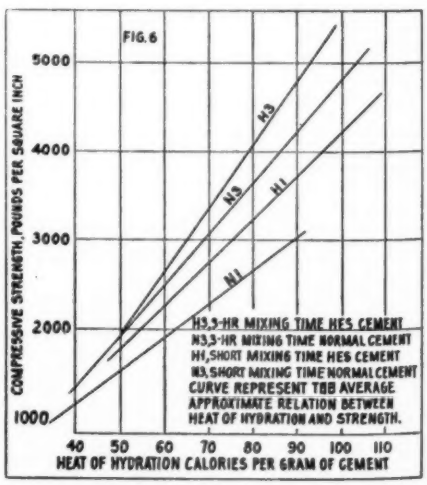


FIG. 6
COMPRESSIVE STRENGTH, POUNDS PER SQUARE INCH
H3,3-HR MIXING TIME HES CEMENT
N3,3-HR MIXING TIME NORMAL CEMENT
H1,SHORT MIXING TIME HES CEMENT
N3,SHORT MIXING TIME NORMAL CEMENT
CURVE REPRESENT THE AVERAGE APPROXIMATE RELATION BETWEEN HEAT OF HYDRATION AND STRENGTH.
HEAT OF HYDRATION CALORIES PER GRAM OF CEMENT

Fig. 6: Relation between heat of hydration of cement pastes and compressive strength

specific gravity, development of strength and evolution of heat.

The hydration products increase with time and their quantity in hardened-cement paste is an index of the degree of hydration of the paste.

Non-evaporable water, calcium hydrate and heat of hydration are shown in Table 2. They increase continuously with the age of the paste. In cements of different chemical composition there is some variation between extent of hydration and quantity of hydration products and heat of hydration: But the two cements used in this experiment are so similar in composition that the figures as shown should be fairly indicative of the extent of hydration and apply equally to the two kinds of cements and also for the cements under different mixing times.

At the age of three months the normal cement hydration products have not reached the HES cement products in quantity, indicating that the normal cement will be somewhat longer in reaching complete hydration and ultimate strength than the HES cement. The extent of hydration for different mixing times for each particular kind of cement is about the same, while the strength of the concrete in the longer-mixing-times is considerably higher, indicating that at complete hydration the ultimate strength of the longer mixed concretes will still be greater than the short-mixing-time concrete. Graphs in Figs. 5 and 6 illustrate this point.

The quantity of liberated calcium hydrate at three months is greater than that calculated to be formed by the splitting off of one molecule of lime from tricalcium silicate. The alcohol-glycerine ammonium acetate method was used on the dried cement pastes having no evaporable water. Some water would be liberated by the reaction, but there would be little anhydrous cement present for it to act on. However, either the method is at fault when used this way or more lime is set free during hydration of concrete than theoretical calculations can account for.

Under normal curing conditions, carbon dioxide from the atmosphere carbonates the surface of concrete, requiring the need of corrections to be applied to non-evaporable water, free lime and heat of hydration. To reduce the size of the corrections, the surface of concrete cylinders older than one week was discarded before separating the cement paste from the concrete.

A heat of wetting correction, ranging from five calories at 24-hours to 15.3 calories at 3-months, was added to the observed heat of hydration. These corrections are possibly too low. No heat of wetting correction was applied to mixer samples, but the rise of temperature of the wet concrete during the initial mixing period indicates that the immediate heat of wetting

TABLE 2: PROPERTIES OF HARDENED CEMENT PASTES, WHICH HAD BEEN SEPARATED FROM AGGREGATE IN CONCRETE CYLINDERS AND DRIED AT 200 DEG. F.

	Original normal cement	Original HES cement	Age, from mixer						Age, 24-hours						Age, 3-days						Age, 7-days						Age, 28-days						Age, 3-months					
			Reference No.						Reference No.						Reference No.						Reference No.						Reference No.						Reference No.					
			N1	N2	N3	H1	H2	H3	N1	N2	N3	H1	H2	H3	N1	N2	N3	H1	H2	H3	N1	N2	N3	H1	H2	H3	N1	N2	N3	H1	H2	H3	N1	N2	N3	H1	H2	H3
Ignition loss, %	0.61	1.06	1.12	1.28	1.72	1.74	1.89	3.32	7.92	7.68	7.55	10.02	9.72	9.57	10.51	9.63	10.52	13.06	12.38	12.08	12.00	11.28	11.06	14.63	14.00	13.01	14.36	13.20	13.92	16.36	16.64	14.61		16.40	15.60	18.12	17.65	17.38
Carbon dioxide, %	0.28	0.24	0.29	0.31	0.52	0.40	0.45	0.69	0.80	0.87	0.94	0.97	1.06	1.15	1.39	1.42	1.22	1.29	0.40	0.42	0.38	0.75	0.57	0.94	0.69	0.73	1.32		0.81	0.61						
Insoluble residue, %	0.19	0.20	0.29	0.80	3.22	0.34	0.73	2.08	1.48	2.98	10.77	2.12	5.03	9.66	1.92	3.92	11.44	3.70	5.23	9.67	2.22	4.87	10.15	5.72	4.93	10.70	2.79	9.30	8.75	2.88	3.07	7.32		4.19	9.43	4.94	5.79	8.51
Free lime (CaO), %	0.72	0.50	0.70	0.72	1.12	0.55	0.63	0.73	7.90	7.80	7.55	8.30	8.32	8.80	10.00	9.60	8.60	10.63	10.10	10.90	10.80	10.00	10.00	11.90	11.70	10.12	12.20	13.44	12.80	12.82	13.60	12.82		13.80	13.10	14.60	14.31	13.10
Heat of hydration, Cal.	0.00	1.60	1.60	0.50	4.00	0.99	1.16	1.75	31.50	38.40	40.40	47.30	46.20	50.90	51.30	55.90	57.80	63.00	66.30	69.10	70.00	75.20	80.50	86.80	77.70	88.10	73.90	71.00	70.60	80.80	79.00	79.90		95.00	95.00	106.00	95.30	101.50
Corrected for CO_2 and ins. res.	0.33	0.83	0.83	0.98	1.24	0.83	0.98	1.25	7.21	7.12	7.34	9.33	9.23	9.52	9.95	9.07	10.44	12.43	11.82	11.81	11.22	10.69	10.90	13.99	13.42	13.09	14.33	14.06	14.80	16.04	16.54	14.72		16.25	16.50	18.28	17.92	17.51
Non-evaporable water, %	0.33	0.83	0.83	0.98	1.25	1.35	1.46	2.74	7.79	7.67	7.95	10.26	10.15	10.48	11.07	10.06	11.76	14.20	13.43	13.44	12.70	12.04	12.32	16.33	15.52	15.11	16.69	16.32	17.33	19.03	19.70	17.23		18.20	19.70	22.29	21.74	21.31
Calcium hydrate, %	0.95	0.95	0.95	1.18	1.95	0.99	1.16	1.75	12.37	12.25	12.48	13.35	13.88	15.40	15.78	15.66	16.56	17.99	17.46	18.50	17.13	17.20	18.50	20.73	20.06	19.00	19.50	22.70	21.90	21.50	22.57	22.52		23.57	23.47	25.40	25.00	24.60
Heat of hydration, Calories/gram	0.00	0.00	1.60	0.50	4.00	0.66	1.75	6.90	32.50	39.00	39.00	47.90	46.20	50.30	54.10	57.40	56.10	63.00	65.60	66.00	76.00	77.00	78.50	85.80	80.00	86.60	81.70	79.50	79.40	88.80	88.30	88.30		104.00	103.90	117.20	106.40	107.80

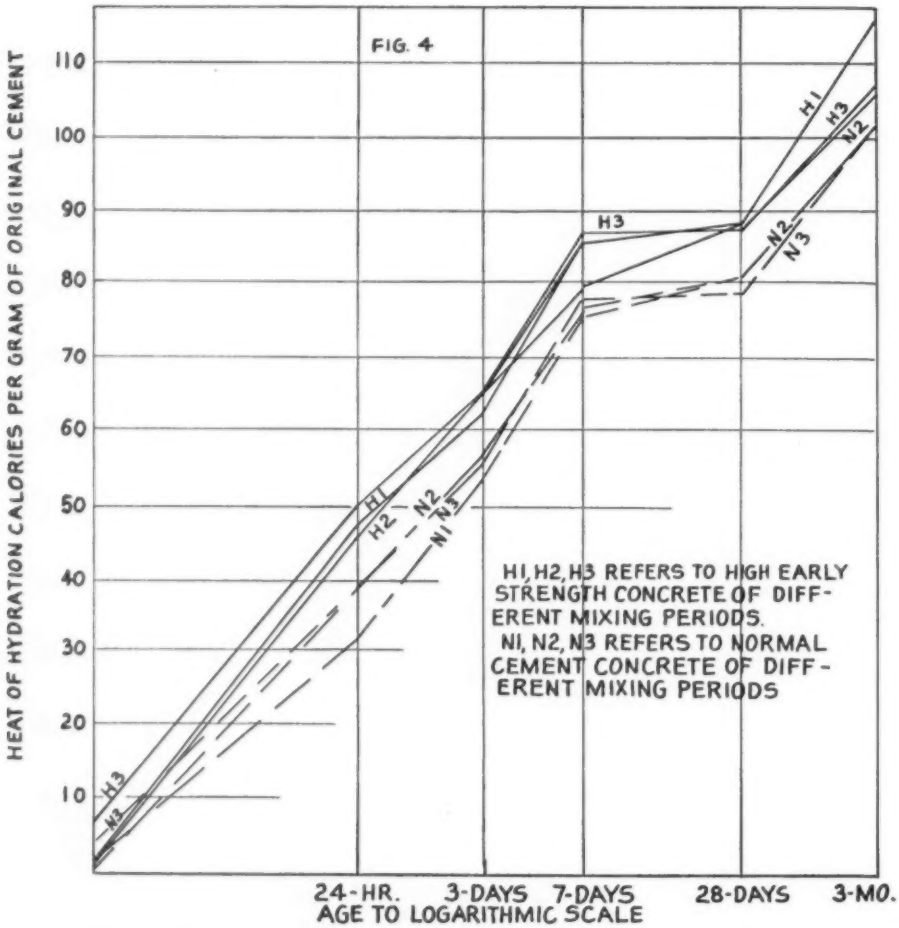


Fig. 4: Graph showing heat of hydration of hardened cement pastes from concrete cylinders. (Calculated to original cement basis.)

was two and four calories per gram on N1 and H1, respectively. The heat of hydration results are, probably, also in error due to the action of hydrofluoric acid (the solvent is a mixture of hydrofluoric and nitric acids) on the large quantities of siliceous insoluble residue present in the hardened cement paste.

The work of some previous investigators has shown a constant proportionality between compressive strength and non-evaporable water content of paste with a constant original water content of the mix. If this held true here line N1 would be the same as line N3 in graphs, Figs. 5 and 6. The same would hold true of the H lines. Either length of mixing-time has altered the relationship or the accumulation of errors inherent in the methods and calculations of this kind of an experiment, have obscured the results.

In a discussion of concrete strength and their gel-space ratio[2], Powers and Brownyard point out that: "Any attempt to express the strength of concrete or mortar as a function of only one independent variable is certain to meet with but limited success, at best, for the reason that more than one independent variable is involved." Perhaps a very constant relationship between any one of the variables; non-evaporable water, liberated lime or heat of hydration and compressive strength, cannot be expected.

[1] Lerch, ASTM Vol. 46, 1946, p. 1252.
[2] Powers and Brownyard, ACI, March, 1947, p. 855.
[3] Gonnerman and Woodworth, Proc. ACI, Vol. 25, p. 344.

Los Angeles A.S.T.M. Meeting

(Continued from page 117)

and lower grade refractories, the outlook for super-duty clays is pessimistic. It will be necessary to beneficiate other refractory materials; kyanite and sillimanite, which are available, and to use bauxite, high alumina clays and imported materials.

Non-Metallics in Insecticides

Present production of non-metallic insecticide diluents on the West Coast approximates 30,000 tons per year.

L. R. MORETH, consulting engineer, discussed "Non-Metallic Minerals Used in the Insecticide Industry." A wide variety of non-metallic minerals is used which are selected to suit the character of the poison, type of pest and method of application.

Such prominent industrial minerals as clay, talc, silica, lime products, gypsum and organic materials such as powdered tree bark and walnut shells, and factors such as grain size of diluent, bulk density, pH value, absorption and abrasiveness were discussed.

Salt

D. S. SEE in "The Salt Industry" outlined the romantic historical background of salt production. Methods of production, producing areas and uses for the world production of 36,000,000 tons in 1945 were described. The United States produced 43 per cent of this total and has doubled production since 1939.

Pacific Northwest Minerals

RICHARD J. ANDERSON, managing engineer, Raw Materials Survey of Portland, Ore., outlined the "Recent Developments in Mineral Raw Materials in the Pacific Northwest."

Peak production was reached in 1942 and 1943. The Pacific Northwest is rapidly developing its important industrial minerals. Intensive studies of methods for concentrating their abundant non-metallic minerals are in progress.

Mr. Anderson discussed abrasives, barite, bauxite, chromite, clays, diatomite, fluorspar, limestone, magnesite, manganese, mineral pigments, phosphate rock, pumice, refractories and silica.

A considerable percentage of the mineral reserves in the Pacific Northwest will be concentrated by froth flotation, for this method is especially applicable to the concentration of barite, fluorspar, limestone, magnesite, manganese, phosphate and pegmatite minerals such as mica, feldspar and silica.

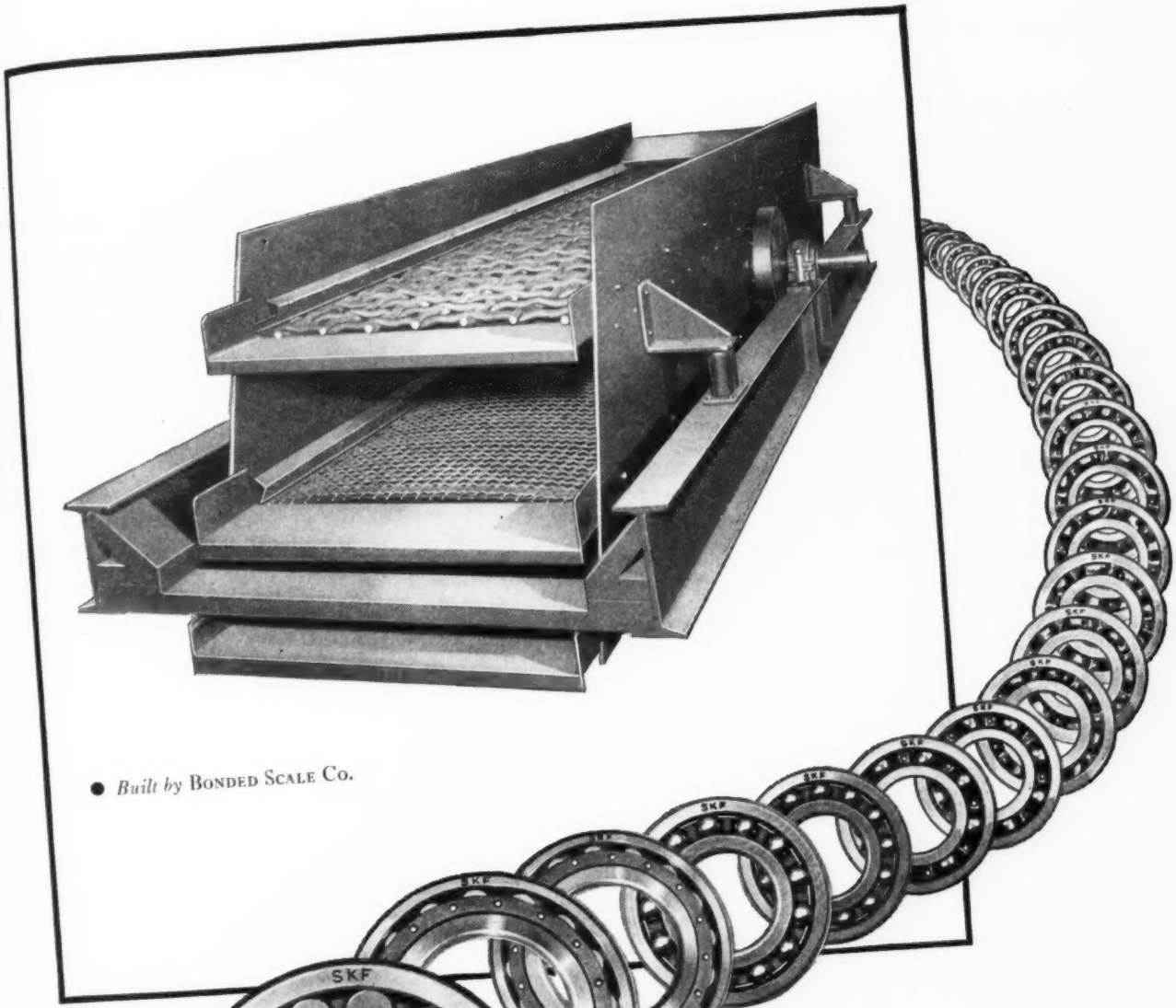
Bulletin on Rock Dust

U. S. BUREAU OF MINES has issued a new bulletin, "Information Circular 7421—Use of Rock Dust and Water Under the Federal Mine Safety Code in Limiting Coal-Dust Explosions," which may be obtained by writing to the Bureau in Washington, D. C.

The circular covers in detail the subject of rock dusting, including the revised Federal Mine Safety Code, various state laws on use of water and rock dust, specifications for rock dust, how to rock dust mines by machine and by hand, sampling coal dust that has been rock dusted, and a complete bibliography of all Bureau of Mines publications on the subject of rock dusting.

Erratum

AN ERROR in the November issue, New Machinery section, has been called to our attention by the Hyster Co., Portland, Ore. The item should read that the Hystaway attachment for D7 and D8 Caterpillar track-type tractors uses a ½-cu. yd. bucket and not 12-cu. yd., as printed. This dragline, clamshell and crane attachment is also available for the D6 model, using a ⅜-cu. yd. bucket.



● *Built by* BONDED SCALE CO.

A RUGGED SCREEN WITH RUGGED BEARINGS

SKF Puts the RIGHT BEARING in the RIGHT PLACE

Tons of rock, crushed stone and other heavy materials, handled by this Heavy Duty Vibrating Screen, pile up punishing, gyrating loads on the eccentric shaft SKF Spherical Roller Bearings. Each of these four bearings has two rows of barrel-shaped rollers, both rows having a common spherical raceway in the outer ring so that the bearing is completely self-aligning. Originating with SKF, the spherical roller bearing brought many outstanding advantages to machines in every field of industry.

6381

SKF INDUSTRIES, INC., PHILADELPHIA 32, PA.

Safe Operating Conditions For Diesels In Mines

DIESEL-POWERED EQUIPMENT for underground use has both advantages and disadvantages, but there is probably no other type of mining equipment now being introduced into American mines about which less is known and about which there is more misinformation. In Europe there are more than 1300 Diesel mine locomotives now in service ranging in weight from 2.5 to 20 tons and with engines from 20 to 200 hp. Some coal mines in England use two 100-hp. units connected in tandem for a total draw-bar pull of 16,000 lb. The 10-ton, 50-hp. unit is the most common found in European mines for main-line haulage. Diesels have been in use underground in Belgium since the early 1920's.

In the United States, so far as is known, only four Diesel locomotives are in use underground: two in metal mines, one in a clay mine and one in an underground limestone mine; though Diesel-powered trucks and other equipment has been in use in underground limestone mines in the central states for over ten years. Some states have laws and regulations prohibiting the use of internal combustion engines underground. These laws were intended originally to prohibit the use of gasoline engines and were enacted before Diesel engines were developed to their present stage of safety and efficiency.

The important difference in chemical composition in the exhaust gas of a Diesel engine as opposed to that of a gasoline engine, insofar as toxic gases are concerned, is that carbon monoxide in a gasoline engine exhaust may be as high as 14 per cent, while exhaust from a Diesel engine may range from 0.02 to 0.05 per cent carbon monoxide. However, it is equally important that the Diesel be properly adjusted for underground service and in perfect mechanical condition. Adjustment of the air:fuel ratio for engines that are used on the surface is intended to give maximum fuel economy, with little or no attention being paid to the chemical composition of the exhaust gases. Diesel engines adjusted for surface operation usually have an air:fuel ratio of 15 to 1 (15 lb. air to burn 1 lb. fuel); while the proper adjustment for underground operation is 20 to 1, as at this ratio the minimum quantity of toxic gases are given off in the engine exhaust.

A Diesel engine operating underground should be equipped with an exhaust-gas scrubber or washer which will remove most of the disagreeable odors, but which will not remove toxic gases. Exhaust gas of a properly adjusted Diesel engine contains an excess of oxygen, even when working under full load and at maximum speed. Comparison of typical exhaust gas analyses when the engine is idling or when it is under full load follow:

	Idling	Full Load
Oxygen	19.63%	14.98%
Nitrogen	79.40	80.63
Carbon dioxide	.89	4.31
Carbon monoxide	.03	.05
Methane	.05	.03
	100.00	100.00
Oxides of nitrogen	20 parts per mil.	43 parts per mil.
Aldehydes	40 parts per mil.	—

Toxic constituents of Diesel engine exhaust are carbon dioxide, carbon monoxide and oxides of nitrogen. Characteristics of the first two are fairly well known to those connected with the mining industry, but the dangerous effects of breathing oxides of nitrogen are not well known, although these are the most dangerous of the toxic gases in Diesel exhaust. The most serious consequence of inhaling these gases is the formation of nitric and nitrous acids in the respiratory system. Maximum proportions of this gas considered permissible in a working environment is only 25 parts per million, or 0.0025 per cent. Oxides of nitrogen in the exhaust are formed solely by the reaction between the oxygen and nitrogen composing the air which is heated to high temperatures inside the Diesel cylinder: fuel oil does not enter into this chemical reaction.

United States Bureau of Mines engineers have determined that practically normal air is required for safe operation of Diesel engines underground or in confined places. This air should contain less than one-half per cent of carbon dioxide and at least 20 per cent oxygen. The odor associated with the exhaust of a Diesel engine is caused by the aldehydes, with the addition of slight traces of oxides of sulfur. Maximum concentration considered permissible is 10 parts per million.

Minimum volume of ventilating air required for safe operation of Diesel engines underground is about 75 c.f.m. per brake-horsepower; this volume of air is required for each Diesel engine in service and is in addition to the volume of air required for normal ventilation. However, if excess ventilating air is supplied to a working place for other reasons, it is possible that no additional air will be required for Diesel engine operation.

Flame arresters on both the intake and exhaust of Diesels used in underground coal mines is a must, because of the ignition hazard if an explosive mixture of gas and air is encountered. In metal and non-metallic mining the use of flame arresters is not so important unless there is a possibility of the presence of an explosive gas as in some of the western tunnels and mines. Arresters should be used in operations containing much wood for timbering and bracing.

Advantages of using Diesel equipment in underground operations are many, particularly where mechanical haulage or where mobility of equipment is essential. Such equipment, in addition to Diesel locomotives, includes bulldozers, tractor loaders, tractor-mounted drill jumbos, portable air compressors and trucks. Some mines are successfully using Diesel shovels.

Diesel locomotives have many advantages over the trolley-type in that they are more flexible; do not require trolley line extensions; bonding and maintaining bonds of rails; in addition to original cost, power and speed. When electric blasting is used in a mine, the Diesel locomotive obviates the stray currents often found in trolley system mines. Diesel powered trucks have been used successfully in both limestone and lead-zinc mines, where it has been advantageous to be able to follow the dip of a formation or to follow a uniform grade; and roads are maintained at small cost.

Principal disadvantage in using Diesel engines underground is that virtually normal air must be maintained at all parts of the mine in which Diesel engines operate. Many metal mines are hot, and an excess volume of ventilating air is provided working sections to cool the mine atmosphere —in these cases, additional ventilating air is not required if Diesel engines are installed. Diesel oil can not be stored underground without constituting a definite fire hazard, though it is by no means as inflammable as gasoline.

A separate split of air should be provided for haulageways in which Diesels are operating, whenever possible, in order to prevent objectionable odors from reaching the working face. Advantages gained by the use of Diesel equipment underground far outweigh the disadvantages.

In an Ohio limestone mine approximately 66,000 c.f.m. is coursed through the underground workings in two splits. Diesel equipment used underground includes six 6-cu. yd. trucks powered by 107-hp. engines, a dozer, tractor loader and a service truck. Analyses of samples of general mine atmosphere taken in two working faces and the main return shaft bottom follow:

	Face of Room A	Face of Room B	Main Return, Shaft Bottom
Oxygen	20.92%	20.72%	20.91%
Nitrogen	79.02	79.08	79.01
Carbon dioxide	.06	.16	.05
Carbon monoxide	.00	.00	.00
Methane	.00	.04	.03
	100.00	100.00	100.00

Successful use of Diesel-powered equipment at this mine is significant.

The foregoing has been abstracted from a paper by J. H. East, Jr., mining engineer, Bureau of Mines; presented before the Mining Section of the National Safety Council convention in the Stevens Hotel, Chicago.

Outlook

(Continued from page 96)

"Our real 'bottle-neck' and chief difficulty has been and still is lack of labor for mining. In the Connecticut area there has not only been a shortage of labor, but it is extremely difficult for us to hire men to work in the open as they prefer employment inside. Because of this condition we are now installing new equipment at our quarries, which we believe will not only give us a better selection of our rock, but will give us increased tonnage and less labor for our men.

"This work should be completed within the next 30 to 40 days, at which time we will have a much clearer picture of what our operations will be in 1948.

"We can assure you that unless radical changes take place other than anticipated, we will no doubt be operating full time during 1948."

Irony Overlooked

THE EDITOR:

I have just finished reading the "editorial" on Social Security in the November issue. May I say that it strikes me as being a piece of the most faulty logic that I have ever read. You made my heart bleed for the poor underprivileged vice-presidents. There are so many of them who take their Government checks "because they are good business-men."

Oh the poor vice-presidents and presidents that have to be retired, by company policy when they reach a certain age and who know that it takes two junior-executives to do their work. What about the junior executive who makes do on a much smaller salary and is compensated with a title. Can he save any money? And what about the people who make the salaries of the executives possible? Where can they turn when the hands can no longer obey the mind?

Your arguments are a return to the days of the 12-hour day and the low salary for all. Business has a social responsibility to the mass of the people. In the days before "social security" when a man had to quit working because of age he often became a direct burden on his family, a burden that had to be carried. Now he is no longer a direct drag on the economy of his children and can maintain his self-respect. You probably knew these things but find it expedient to waste good newsprint on a line of baloney.

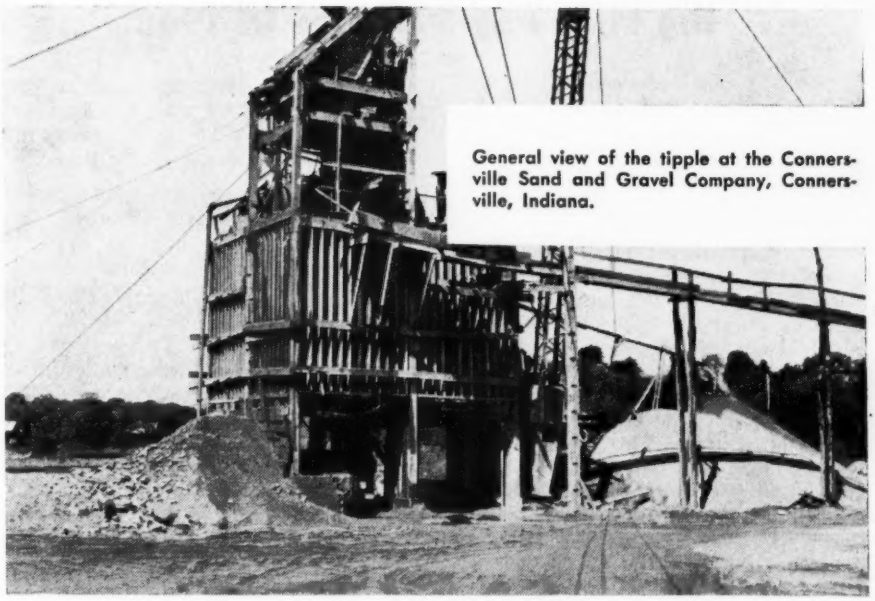
In short, your article made me and all those I showed it to, want to puke.

Yours for enlightenment, and a lasting peace,

JOSEPH IRVING
Brooklyn, N. Y.
November 11, 1947

Start Crushing Operations

L. R. FALK QUARRY, St. Ansgar, Iowa, has started the production of crushed road rock and lime using a New Holland double impeller crusher. Present capacity is 75 to 100 tons per hour.

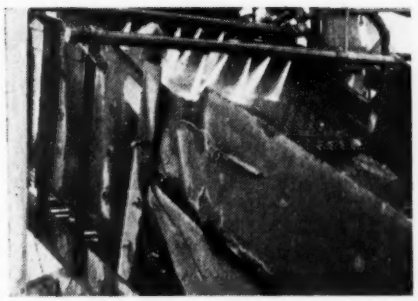


General view of the tipple at the Connersville Sand and Gravel Company, Connersville, Indiana.

Satisfied Customers
... PLAT-O product

The rugged design and all-welded construction of Deister Plat-O Vibrating Screens assures maximum production and minimum maintenance throughout long service life. These are important reasons why leading aggregate producers have standardized on Deister Screens.

Among the many "well satisfied" customers who rely on Plat-O Screens are R. A. Wilson, president, and Harley Corbin, plant foreman, Connersville Sand and Gravel Company, Connersville, Indiana. The company produces concrete gravel, sand, and pea gravel. Their 4'x8' triple-deck Plat-O Vibrating Screen, now with three years of operation behind it, handles 85% of the raw material supplied by a 2-yard bucket in a slack-line operation. The Plat-O has given trouble-free performance since its installation.



Close-up of the Deister 4'x8' Plat-O Vibrating Screen which handles 85% of the raw material.

For complete information on how you can apply Plat-O Vibrating Screens to your operations, write to the Deister Machine Company, Fort Wayne 4, Indiana.

DEISTER MACHINE COMPANY
Fort Wayne 4, Indiana

Big Highway Program In 1948

(Continued from page 101)

to be compacted with a tamping roller, or if compaction cannot be obtained by that means, by spreading in layers and compacting with truck rollers. Usually, the blankets are six inches in thickness and extend two feet outside of the edge of the slab. We do not attempt to drain them. It is our belief that this type of sub-base will minimize or eliminate pumping. We have not had enough experience yet to say whether we should narrow down the large range of gradations which are permitted for the sub-base material itself, but it is possible that eventually we may find that this should be done. It is possible also that experience and study may indicate that the thickness and width should be changed."

Kansas

"It is our opinion that our sub-bases should be compacted and should be of impervious material with at least 55 per cent retained on the 200-mesh sieve."

Kentucky

"Our department is using the granular type sub-base under concrete paving made up of No. 6 and No. 10 sizes aggregate, watered, rolled and compacted. We do not consider this impervious. We believe it to be a compromise between the impervious and the drainable type of sub-base that removes some of the objectionable features of the two types of sub-base mentioned."

Maryland

"The State Roads Commission prefers the drainable sub-base except on rare occasions. It should not be termed loose, as measures are taken to insure its being placed at maximum density.

"The three following specifications describe materials used. Type No. 2 makes up about 75 per cent of these treatments:

" 'One of the below-described materials shall be used. The type shall be optional with the contractor unless specified.

"*Type 1.* Type 1 sub-base material shall be either sand, or stone, or slag screenings having the following gradations:

Square Opening Screens	Per Cent Passing	
	Per Cent	Per Cent
¾-in.	Min. 100	Max. ...
½-in.	Min. 90	Max. 100
No. 100	Min. 10	Max. 30

"The plasticity index of the material passing a No. 40 screen shall be not more than 3.

"*Type 2.* Type 2 sub-base material shall be a run-of-bank gravel or run-of-crusher stone or slag having the following gradation:

Square Opening Screens	Per Cent Passing	
	Per Cent	Per Cent
2½-in.	Min. 100	Max. ...
2-in.	Min. 90	Max. 100
1-in.	Min. 70	Max. 100
No. 10	Min. 25	Max. 75
No. 100	Min. 0	Max. 20

"The plasticity index of the material passing a No. 40 screen shall be not more than 3.

"*Type 3.* Type 3 sub-base shall be either crushed stone, crushed slag or crushed gravel having the following gradation:

Square Opening Screens	Per Cent Passing	
	Per Cent	Per Cent
3½-in.	Min. 100	Max. ...
3-in.	Min. 90	Max. 100
2-in.	Min. 35	Max. 70
1-in.	Min. 0	Max. 15

"Los Angeles abrasion loss on Type 1, Type 2 and Type 3 material, excepting sand as proposed in Type 1, shall be not greater than 55 per cent.' "

Massachusetts

"In a state where frost action is severe, there can be no question about the type of sub-base to adopt. Sub-base should be gravel or other similar materials of drainable construction. It is unthinkable to construct an expensive pavement upon materials which are subject to frost heaving and which promote joint pumping, unless the cost of such materials is prohibitive, as may be the case in some parts of the country."

Mississippi

"We have used for more than 12 years sub-bases, immediately underlying our pavements, comprised of friable type soils placed in varying thicknesses to take care of the pavement type constructed thereon. The thickness of the friable material so placed on any of our construction has been made dependent upon the type of subsoil and upon the pavement type. Experience records have proven for various types of pavement the required amount and characteristics of blanketing mediums, considering the particular soil on which same is placed, and from some rather sad experiences we long ago gave up the idea of attempting to use immediately underneath the pavements heavy soils, of which we have a great many and which due to their high volume change have never proven of satisfactory adaptability for proper pavement behavior."

Missouri

"We are currently using the dense type of sub-base."

Nebraska

"To date we have not decided upon any particular type of sub-base treatment, and in the past we have used principally granular materials that are available locally and that are most economical to use. We have also used both the compacted and drainable types. When replacing a stabilized base and bituminous surface with concrete, we use the salvageable part of the stabilized base and bituminous surface as a sub-base, which results in the compacted type. Otherwise, we have used the drainable granular type from local pits."

North Carolina

"We prefer sub-bases constructed of a porous material which will prevent heavy clay from working through the material and causing a pumping action. On all of our concrete roads where we do not have a sandy granular material over the sub-base, we place three or more inches on the sub-grade, prior to constructing the concrete pavement. We believe this will eliminate pumping which has caused us considerable concern in connection with pavements constructed without this type treatment."

North Dakota

"The standard sub-base is a loose sand cushion three inches in depth and extending from shoulder to shoulder.

"In addition to the desirability of the sand cushion, it is believed that joint spacing is important in the performance of concrete pavement. Consequently, transverse dummy joints are spaced 15 ft. on centers. These joints, plus the use of a longitudinal center joint, control all slab action satisfactorily.

"The gradation for sand for sub-base is as follows:

	Per Cent Passing
½-in. sieve	100
¼-in. sieve	75-100
No. 10 sieve	50-100
No. 48 sieve	5-50
No. 100 sieve	0-20
Silt	Max. 10%
Shale and soft rock	Max. 8%
Clay and colloids	Max. 12%

Oregon

"We prefer a sub-base of loose, drainable construction."

Rhode Island

"We use a sub-base of the drainable granular type whenever possible. The use of this type of material has given us a minimum of frost heaves or boils and in most cases has been cheaper than the use of compacted impervious type bases would have been if used on the same projects."

South Carolina

"Type of base depends on local drainage conditions and availability of local base material. Macadam bases are being constructed on some of the heavier traveled sections of highways."

South Dakota

"We prefer sub-base of loose, drainable construction."

Virginia

"Our specification for subgrade material is as follows: 'Material for subgrade treatment shall consist of a natural or artificial mixture of gravel or crushed stone, sand, and clay or soil binder, with a reasonable gradation, maximum size not to exceed three (3) inches. The material passing the No. 40 sieve shall have a liquid limit not greater than thirty-five (35), and a plasticity index not greater than twelve (12).'"

West Virginia

"The present practice in West Virginia is to place a course of pervious material on the subgrade and primary under the concrete pavement, and to carry this material out to the shoulder or ditch line of graded roadway with the object of providing for subgrade drainage."

Wisconsin

"Under our soils and meteorological conditions, sub-bases or ballast courses must be pervious or freely draining and extend across the full width of the roadbed or from ditch to ditch. If we were to try to build compacted sub-bases, they would remain in that state only for a very short period of time.

"The sub-base material must have considerable void space and these spaces must be of small diameter to inhibit fouling by the underlying soils. We, therefore, specify sand or sand gravel with a limitation of not more than 15 per cent, passing the No. 200 sieve together with a general requirement that in gravels there shall be a substantial excess of sand over that necessary to fill the voids between the gravel particles.

"Ballast courses of these characteristics and design have been successfully used for about ten years; in some cases even under the severest conditions of exposure in the state.

"The more recent design and construction also provide for stabilizing the surface of these ballast courses with a 3- to 4-in. thickness of crushed and graded gravel or stone, upon which the pavement is then laid.

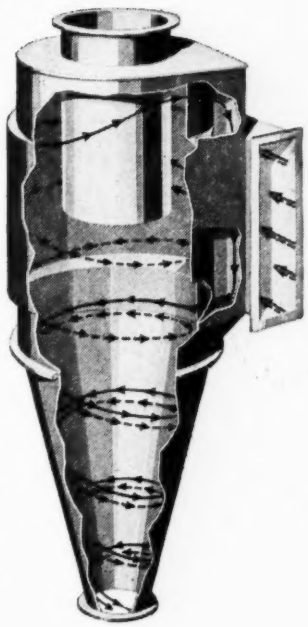
"This precludes conditions of nonuniformity of bearing which may be generated by filling of ruts caused by construction equipment traffic with loose sand and also will inhibit to a large degree the rhythmic waviness present at times in pavement laid on certain soil types, including the finer sands, and which is due to a differential in the moisture in the soils at the joints, rather than to a differential in temperature between the upper and lower portions of the slab as is sometimes assumed."

(East) Anonymous

"We prefer sub-base of drainable construction. We specify gravel—minimum amount of 200-mesh material."

in planning

Dust Recovery



The "Brass Tacks" Approach

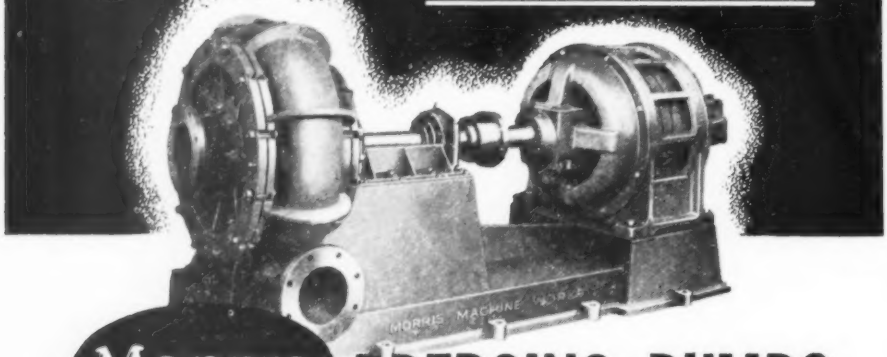
is to get down to fundamentals. What equipment will collect dust particles in the sizes that count, with an efficiency you can count on, and at the most practical cost.... For economy, a system's got to be simple — without moving parts or need for maintenance. That means a Buell van Tongeren Cyclone, if you really want to trap the low-micron fines, too. Only the van Tongeren has the Shave-off, to put it in the high efficiency class. A Buell catalog makes this all plain. Write for one, its "brass tacks" approach makes it easy to read.

Buell Engineering Co., 2 Cedar Street,
Suite 5000, New York 5, N. Y.

buell

Engineered Efficiency in DUST RECOVERY

PROVED BETTER... because they WORK BETTER!



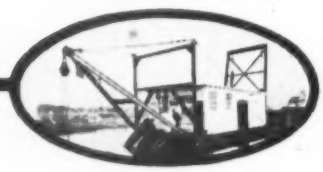
MORRIS DREDGING PUMPS

In almost any dredging operation . . . *they give greater performance at lower maintenance cost*

● Purposely made for high vacuum, Morris Pumps dredge to greater depths and give up a higher percentage of sand, gravel and other abrasive materials.

● The proper relationship between shell and impeller designs produces smooth, easy flow of materials . . . without eddies, turbulence or excessive friction losses. This feature alone reduces wear, abrasion and power consumption.

● When long service finally requires renewal of a part, replacement on the Morris Dredging Pumps can be made easily, quickly and economically . . . *with only slight interruption of service.*



Morris Will Build a Dredge for Your Particular Job . . .

● All the components of the dredge—hull, rigging, hoist, spuds, ladder, ladder head, and cutter will be designed and built for the individual type of deposit and service you require. All excavating and auxiliary pumps are of the famous Morris Centrifugal type . . . driven by electric, Diesel or steam power, according to the needs of your job.

Morris Dredges Are Custom-Built . . . Yet Moderate in Cost

WRITE TODAY! Send for Free Bulletin No. 177. It illustrates and describes a wide range of dredges.

MORRIS MACHINE WORKS
Baldwinsville, N. Y.
Branch Offices in Principal Cities

MORRIS CENTRIFUGAL PUMPS

Ohio Dust Control Law

OHIO has a law providing several regulations for the prevention and control of diseases resulting from exposure to toxic fumes, vapors, mists, gasses and dusts in order to protect the public health, read, in part: Concentration of dusts, fumes, mists, vapors or gases, in the air breathed by employes shall not exceed the following maximum allowable concentrations for an 8-hr. daily exposure:

Mineral Dusts	Concentration (million particles per cu. ft.)
Asbestos	5
Silica, free or uncombined:	
over 40 per cent...	5
20 to 40 per cent..	10
10 to 20 per cent..	20

Explanatory note: At least three atmospheric samples, spaced at intervals to yield an average measurement of exposure over the entire cycle of operation under test shall be collected in the breathing zone of the worker. Free silica content shall be the per cent of free silica in the fraction of the air-borne dust in the breathing zone of the worker that is smaller than 5 microns in maximum diameter.

Open Sand, Gravel Plant

ROY AND HOWARD BOLD, brothers, who were born and raised in Garrison, N. D., have recently started operation of a $20,000 sand and gravel plant in that city. Four sizes of material are produced, and the plant is built around a Cedar Rapids washing screen and vibrating screen.

River Dock Leased

SHIPPINGPORT SAND CO., Baden, Penn., has leased the river dock and other facilities of the West Penn Sand and Gravel Co. (Pittsburgh) at Rochester, Pa. The former firm has been in the sand business for many years at Shippingport.

A.S.A.E. Winter Meeting

THE AMERICAN SOCIETY OF AGRICULTURAL ENGINEERS held its Winter Meeting at the Stevens Hotel, Chicago, Ill., in December, at which time power and machinery, rural electric, farm structures, and soil and water were discussed.

Under the latter heading, papers were presented on durability of drain tile by P. W. Manson, University of Minnesota; concrete farm drain tile by W. G. Kaiser, Portland Cement Ass'n; and results of low-cost concrete flumes by C. A. Kincaid, Portland Cement Ass'n.

Under the farm structures program, discussion covered the use of structural clay tile in farm construction by John M. Anderson, Structural Clay Products Institute; asbestos sheets in farm building construction by A. W. Bergman, Cement Asbestos Products Ass'n, and asphalt roofing by J. L. Strahan, Asphalt Roofing Industry Bureau.

Trends in Aggregates

(Continued from page 105)

duced nothing but lightweight blocks. Perlite, the expanded volcanic rock, is probably the most spectacular of the many lightweight aggregates now being processed. For the most part, the perlite exfoliation industry has been in small hands but during the last year or so, three well financed and nationally known organizations have entered the picture. One is to ship the crude volcanic rock from Arizona to a new processing plant in New Jersey. Shipments possibly could be via Panama Canal. The second perlite operator with large investments in Oregon is the most advanced, from a technological standpoint. This company is processing crude perlite, but will ship the crude material to exfoliation plants throughout the United States. One of the national distributors is now building a modern plant in Michigan, the first of many to follow.

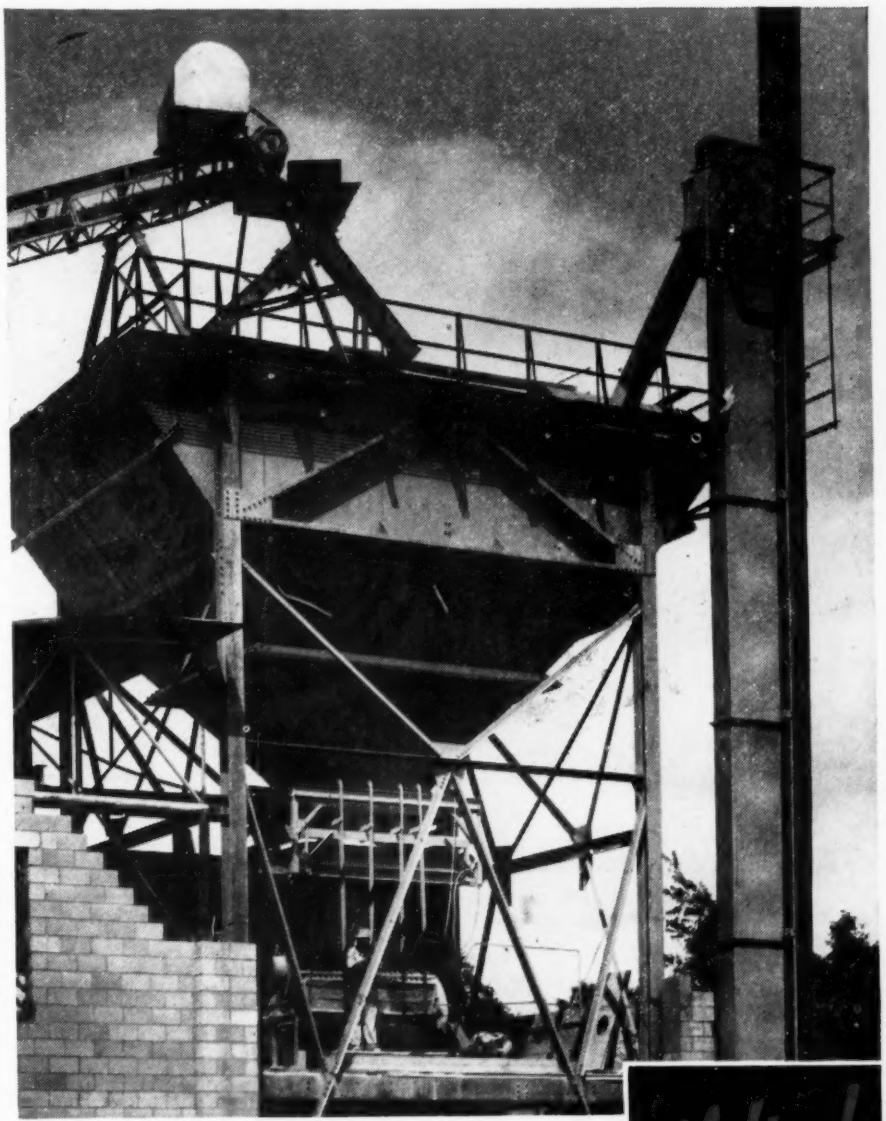
In the Far West there seems to be a greater tendency for the aggregate producer to deliver by company-owned trucks. In the East a great amount of aggregate is delivered by trucks. At plant after plant visited possibly 50 per cent of the production was going out by trucks, and these trucks were for the most part of relatively small capacity and owned outside the industry. The tendency, however, is for the industry to own its own delivery fleet of dump and ready mixed concrete equipment. In one of our large cities, the identity of which will remain undisclosed at this time, it was the practice of the aggregate producers to batch ready mixed concrete to contractors and truck owners. The aggregate producer had no trucks of his own. Suddenly all activity came to a dead stop for many days. No trucks appeared at the several widely scattered plants for the explained reason that competitors had bought up all the mixer truck equipment, leaving this operator high and dry. Obviously, there is only one final solution to producers similarly situated and that is to own outright the means of delivering concrete.

One of the big bugaboos of the ready mixed concrete producer is the "waiting time." There seems to be a hit and miss arrangement as to who is to pay for what. Western producers, in some instances have worked out a time-mileage basis of payment which is added to the base price of the concrete. If there is any waiting time at point of delivery, the contractor or buyer of the material pays the bill.

Precast Ahead in the East

In the matter of precast concrete items, the Eastern section far outstrips the West. To be sure, pre-fabricated houses and buildings in the Southwest are in the picture, but in the East concrete piling of large

HELTZEL BINS



When you think of bins you think of Heltzel Bins. That's natural because your experience and the testimony of all bin users have proved that Heltzel's concentrated engineering in concrete equipment has brought about practical developments that pay off in durability, versatility and trouble-free operation. We're proud of the demand for Heltzel bins and batchers and we're sorry we can't ship orders at a normal rate. We're doing the best material supply will permit. We know you want the best and will be patient and make your old equipment do until you can install a Heltzel.

Heltzel BUILDS IT BETTER

BINS, Portable and Stationary
CEMENT BINS, Portable and Stationary
CENTRAL MIXING PLANTS
BATCHERS (for batch trucks or truck mixers with automatic dial or beam scale)
ROAD FORMS (with lip curb and integral curb attachments)
CURB FORMS
CURB AND GUTTER FORMS
SIDEWALK FORMS
CONCRETE BUCKETS
TOOL BOXES
FINISHING TOOLS FOR CONCRETE ROADS

HELTZEL STEEL FORM & IRON CO.
WARREN, OHIO · U. S. A.

***SECO** is one of America's largest makers of **VIBRATING SCREENS** exclusively*

Our greatly expanded facilities now make it possible for you to obtain prompt delivery on standard or special models of Seco Vibrating Screens, the only vibrating screens with fully controlled true circular action. Send your problem today! Dept. M.

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SCREEN EQUIPMENT COMPANY, INC.
PRODUCERS OF VIBRATING SCREENS EXCLUSIVELY
Buffalo 21, New York
In Canada: United Steel Corp., Ltd., Toronto

Trends in Aggregates

(Continued from page 141)

dimensions is being pre-fabricated. Reinforced concrete structural units to compete with steel are in the advanced stages. One producer in Pennsylvania made precast bridge slabs, and a bridge in eastern Pennsylvania was erected using these slabs made by the vacuum process. More of these bridges will be erected, provided the one now in use stands up well under this winter's traffic. In the East, many operators are producing such things as bath tubs, stationary wash tubs and in colors of various hues; burial vaults, fireplaces, and a wide variety of miscellaneous decorative articles. In the West these are not so apparent although the West does produce a wider variety of block sizes and shapes, and has blended these into architectual house designs that are very beautiful. The use of mortarless blocks, a Western development, is gradually moving eastward.

Many of the new plants in the West were using hydroseparators to get more fines and almost all of them were after more sand than was the case a few years ago. Practically all these Western plants produce gravel and crushed gravel (so-called crushed rock) and the two products are kept separate. Washing of both products seemed to be fundamental. One plant was using large diameter thickener to recover and re-use wash waters from the plant. Another sand plant had installed the first hindered settler of its type, which was capable of producing eight sizes of sand that were being re-blended to make three commercial sands.

In Idaho, concrete blocks were being hauled by trucks for over 200 miles radially from the plant with semi-trucks and trailers hauling in excess of 2000 of the 8- x 8- x 16-in. block per load.

In New York, one of the larger trap rock producers entered the sand and gravel field for the first time, constructing a new, modern, and large capacity plant. In Baltimore a new gypsum and wallboard plant representing an investment in the $8,000,000 range will soon go into production. These are the highlights of the year-long trip, but actually there were many more developments too detailed to go into here.

Canada Cement Mill Extension

CANADA CEMENT CO., LTD., Montreal, is pushing to completion work on its Exshaw, Alta., plant expansion, according to J. D. Johnson, president. The extension is scheduled for operation early in 1948, and is expected to nearly double plant capacity to about 5000 bbl. of portland cement. Expansion programs were completed earlier at the company plants at Montreal East and St. Annes, near Belleville, Ont.

Labor Relations

(Continued from page 129)

received. The present minimum salary to qualify for an executive (providing he does executive work) is $30 a week; and for administrative and professional employes $50 a week or $200 per month. The $30 a week is the same as the C.I.O. is advocating as the minimum rate for common labor (75¢ per hour), so it is not surprising that the C.I.O. witness before the congressional committee recommended $500 per month as the test of an executive, administrative or professional employe. On the other hand most employer witnesses took the stand that amount of salary should not enter the test at all; only the employe's actual function in the business is the true test. Several suggested the use of the same definition as in the new Labor-Management Relations Act for "supervisors."

Some of the other industry representatives suggested repeal of the 40-hour week limitation; such details could better be left to collective bargaining; a few would abolish the minimum wage. Some clothing manufacturers on the other hand spoke for raising the minimum wage to 65¢ or 75¢ per hour, apparently to make their competitors' wages the same as those they are compelled to pay by union contracts. Union labor representatives were, of course, unanimous in demanding a 75¢ per hour minimum, and they, too, wanted the wording of the law changed to include employes in all operations "affecting" interstate commerce. Representatives of retailers, laundries and other local service industries presented touching evidence of some of the fine distinctions that have been drawn between retail and wholesale business, since a retailer who sells 25 per cent of his annual local sales to a customer in an interstate business is now held to be under the Act as a wholesaler.

The Issue

The real issue is the same one that has arisen before in analyzing some of the results of the labor laws and other legislation of the past 12 or 13 years — legislative vs. administrative law. As Mr. Walling, most recent F.L.S.A. ex-administrator, plaintively remarked to the congressional committee: "The most important defect in the law was that so much litigation had to be resorted to to find out what it means and what people's rights and duties are." He did not seem to appreciate that it was largely his vacillating and uncertain administration that caused much of the litigation, because his only suggestion to meet this defect was to have Congress give the administrator more "authority" to make more binding regulations; he also wanted the administrator to have authority to sue employers for an employe's back wages and penalties. Now the employe must bring his own suits.

The reader who desires to corre-

Book of Profits

Get this NEW "primer" that takes the mystery out of the washing, classifying, and dehydrating of sand and gravel. Charts, tables, diagrams, "X-ray" photographs and "exploded" views reduce to utmost simplicity the function, design, and operation of the Eagle Equipment, that has permitted plants all over the country to pocket additional profits.

For Fine Material: Eagle Long Weir Screw Washer-Classifier-Dehydrator.

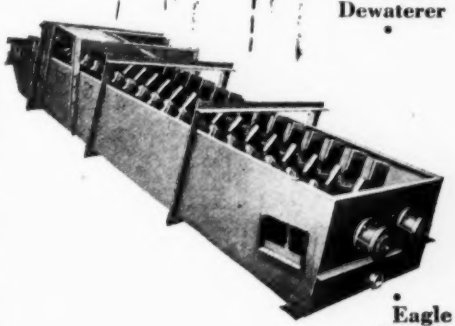
For Coarse Material: Eagle Screw Washer-Dewaterer.

For The Toughest Clay Ball Removal: Eagle Paddle Type Log Washer.

The NEW Long Weir, with adjustable weir lips; the NEW Perforated Flights; the NEW Built-In Feed Box; the Log Washer's NEW renewable, corrugated paddle shoes—these and all other features are fully described in Catalog 47. Send for your copy today.

Eagle Long Weir Screw Washer-Classifier-Dehydrator

Eagle Screw Washer-Dewaterer



Eagle Paddle Type Log Washer

SINCE 1872
Progress...Service

Sand and Gravel Equipment

"SWINTEK"—DREDGE LADDERS—SCREW WASHERS
LOG WASHERS—DEHYDRATORS—SAND TANKS
CLASSIFIERS—REVOLVING SCREENS

EAGLE IRON WORKS

137 Holcomb Ave. • Des Moines, Iowa

Sauerman Slackline Cableway above lifts gravel from wide pit and delivers 110 cu. yd. an hour to plant at cost of few cents a yard.

Sauerman Scraper setup with elevated tall bridle stockpiles two sizes of rock at crushing plant.

INCREASE YOUR

PROFITS

by moving materials the SAUERMAN Way

Lower costs are the rule when Sauerman Scrapers and Slackline Cableways are used in sand and gravel excavation, stockpiling and other material-handling jobs where the long reach of these machines can be employed to advantage.

Digging, hauling and automatic dumping of any bulk material become one continuous operation, entirely controlled by one operator. First cost is low; upkeep is simple. Wide range of handling capacities and operating spans.

Let Sauerman engineers study your digging or stockpiling problems. Their advice may save you money and will be given free. Write for catalog.

SAUERMAN BROS., INC.

530 S. Clinton St., Chicago 7, Illinois

The New Marmach Loader

Speed

One man—the driver—loads, hauls, and unloads. There is no waiting for other loading or digging equipment.

Simplicity

Two simple levers in cab control the double hydraulic action which absorbs the hardest knocks and makes for smoothest operation. No gears to wear or break.

Marion Machine Co.

Marion **North Carolina**

spond with his Congressman or Senator about revision of the F.L.S.A., could be helpful if he recognizes this real issue at stake and merely suggests that the law be rewritten so that the Congress prescribes the actual law and not the administrator or the courts. There is now enough experience in the record for Congress to do this. The confusion created by diverse interpretations of three different administrators and scores of different court decisions is proof enough of the futility of administrative law in a country where people are accustomed to individuality and initiative, and not to slavish subserviency to a government bureaucracy.

FINANCIAL

RECENT DIVIDENDS

Alpha Portland Cement Co.	$1.25	Dec. 10
Basic Refractories, Inc.	.11	Dec. 15
California Portland Cement	5.00	Dec. 10
Canada Crushed Stone	.10	Dec. 20
Canada Crushed Stone (extra)	.10	Jan. 2
Colonial Sand & Stone	.10	Jan. 22
General Portland Cement	.25	Dec. 16
Gypsum Lime & Al., Canada	.20	Dec. 1
Hercules Cement Corp.	.50	Dec. 11
Industrial Silica	.16	Dec. 10
Industrial Silica (accumulation)	.16	Dec. 10
Industrial Silica	.16	Mar. 10
Lone Star Cement Corp.	.87½	Dec. 21
Lone Star Cement Corp. (year end)	.75	Dec. 21
Monolith Portland Cement	.25	Dec. 15
National Gypsum	.50	Dec. 19
Pacific Portland Cement	6.00	Dec. 20
Peerless Cement	.25	Dec. 31
Penn. Glass Sand	.40	Jan. 1
Penn. Glass Sand (pf.)	1.25	Jan. 1
U. S. Gypsum Co.	.50	Dec. 31
U. S. Gypsum Co. (extra)	1.00	Dec. 24
U. S. Gypsum Co. (pf.)	1.75	Jan. 2
Whitehall Cement	1.00	Dec. 15

KELLY ISLAND LIME & TRANSPORT CO., Cleveland, Ohio, recently declared a dividend of 35¢ per share, which will mean a total disbursement of 80¢ in 1947, as against 60¢ in 1946.

YOSEMITE PORTLAND CEMENT CORP., Merced, Calif., will declare a final liquidating payment of approximately 25¢ during the first quarter of this year, it is expected, making total distributions $7.50 a share. The initial liquidating dividend of $3 a share was paid in December, 1944, and with the final payment, total disbursements will amount to $1,946,573. There are 259,543 shares of preferred stock outstanding. No payments will be made on common stock.

ECONOMY BLOCK CO., Milwaukee, Wis., has increased its stock from 150 shares, par value $100, to 1000 shares, par value $100.

CALAVERAS CEMENT CO., San Francisco, Calif., has extended to January 31, 1948, the period during which holders of $100 par 7 per cent preferred stock may voluntarily exchange their shares for new securities and cash under the recapitalization plan which became effective June 2. For each 7 per cent preferred share and accrued dividends thereon, holders are

entitled to receive $100 income debenture 4½s, due 1966, one share of $50 par 5 per cent conv. prior preference stock and $3.25 in cash, plus $2.25 debenture interest to June 30, 1947.

ALPHA PORTLAND CEMENT CO., Chicago, Ill., in authorizing $1.25 as a year-end common payment, compared with a year-end of $1 in 1946, brought last year's total payments to $2 as against $1.75 in 1946.

CONSOLIDATED ROCK PRODUCTS CO., Los Angeles, Calif., recently made an interest payment of 1½ per cent on first fixed and income 3s-5s, due 1962, to holders of record, October 16, 1947.

PERMANENTE CEMENT CO., Oakland, Calif., has filed with the SEC a registration statement covering 150,000 $1 par common shares to be offered through an underwriting group headed by Dean Witter & Co., San Francisco, Calif. Proceeds are to be used to reduce bank loans and for working capital.

GIANT PORTLAND CEMENT CO., Philadelphia, Penn., expects to announce plans shortly for financing an approximate cost of $1,650,000 for the purchase and conversion of an alumina plant at Harleyville, S. C. Cost of converting the alumina plant to the manufacture of cement has been set at about $1,000,000, and purchase price of the plant from WAA was $666,815.

LONE STAR CEMENT CORP., New York, N. Y., in announcing a year-end dividend of 75¢ and the regular quarterly dividend of 87½¢ on common stock, both payable December 21, 1947, brought the year's total payments to $4.25.

NAZARETH CEMENT CO., Nazareth, Penn., at the end of last year declared a dividend of 75¢ per share, as against 50¢ in 1946.

CONSOLIDATED SAND & GRAVEL, LTD., Toronto, Ontario, Canada, has reported that 7 per cent cum. conv. preference shares have been removed from listing on the Curb Section of the Toronto Stock Exchange, and that as the company is practically a wholly-owned subsidiary of Standard Paving & Materials, Ltd., its operating results will hereafter be incorporated in the annual financial statement of the latter company.

GENERAL PORTLAND CEMENT CO., Chicago, Ill., has reported earnings amounting to $1,775,100 or $1.77 a common share for the nine months ended September 30, 1947, as compared with $1,360,000 or $1.36 a share in the like period in 1946. Net sales were $10,310,600 in the three quarters as against $8,471,900 last year. Profit before taxes was $2,194,000 as against $2,864,100 the year before. Trading in the common stock of the cement company began recently on the New York Stock Exchange. The company has 1,750,000 shares of $1 par value common stock authorized, of which 1,001,514 shares were outstanding September 30. Through the exercise of warrants outstanding since consolidation last February of three cement

THE Walnut Test

...SHOWS HOW A NEW HOLLAND

Double Impeller Breaker

PERFORMS PRIMARY AND SECONDARY CRUSHING IN ONE OPERATION

Try this test. Tie a walnut on a string and whirl it against a hard surface. Note how completely it breaks... how uniform the pieces are . . . how little effort was required. That's because breaking force was evenly distributed. * * *

That same action . . . breaking by impact . . . takes place in a New Holland Double Impeller Breaker. Stone that is fed to the machine . . . every fragment of it down to the pre-selected product size . . . is hurled repeatedly against massive breaker bars at speeds up to 100 mph. Thirty inch stone can be reduced to minus ⅞ inch in *one* low-cost, efficient operation. Handling costs are reduced . . . power requirements minimized . . . profits multiplied.

New Holland Double Impeller Breakers are available in three models to meet varying production requirements. Don't delay investigating the increased profit possibilities of this revolutionary new method that reduces rock in a *single* operation. Write today for illustrated booklet that fully describes New Holland Double Impeller Breakers.

NEW HOLLAND MANUFACTURING
Mountville, Pennsylvania

companies to form the present company, additional shares of common stock may be issued from time to time. The company has no funded debt.

Manufacturers' News

Dixie Machinery Mfg. Co., St. Louis, Mo., manufacturers of crushing, grinding and pulverizing equipment, announces that Elmer W. Noxon, vice-president, has assumed the presidency of the company following his purchase of all outstanding stock of the organization. H. H. Storck, who has been with the company for 21 years, was re-elected secretary, and J. L. Leykam was elected treasurer. Mr. Noxon has also served in the capacity of manager and chief engineer of the Ralston-Purina Co.

Elmer W. Noxon

Caterpillar Tractor Co., Peoria, Ill., has announced the appointment of Herman F. Haven as western division parts manager, succeeding Eldon Mason who has resigned to become general parts manager for Holt Bros., Caterpillar distributors at Stockton, Lodi and Tracy, Calif., W. E. Doersam continues as assistant western division parts manager. Jack H. Gill has been appointed engine sales consultant with headquarters in Peoria, Ill.

Joseph T. Ryerson & Son, Inc., Chicago, Ill., has recently completed the new offices and addition to the steel-service plant at Cleveland, Ohio, which, according to William O. Springer, plant manager, will be used largely to warehouse stocks of alloy and carbon steel bars, mechanical tubing and sheet steel. Earl R. Nelson has been appointed manager of the Cincinnati plant, succeeding Wayne D. Dukette who will head the new steel-service plant in the San Francisco area, now under construction.

Wall Colmonoy Corp., Detroit, Mich., has announced the following distributors: L. P. Okelberry, Murtaugh, Idaho, for the State of Idaho; Middlesex Welding Supply Co., New Brunswick, N. J., for central New Jersey; and Essex Welding Equipment Co., Newark, N. J., for northern New Jersey.

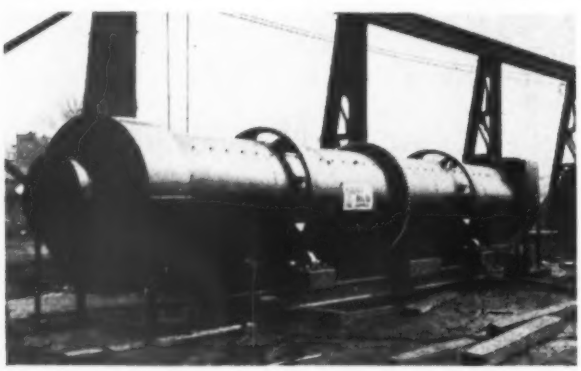
Wickwire Spencer Steel Division of Colorado Fuel & Iron Corp., New York, N. Y., has appointed W. T. Stratton as director of purchases, with headquarters in Buffalo, N. Y. Mr. Stratton will replace E. A. Johnston, who has resigned.

St. Regis Paper Co., Multiwall Paper Bag Plant, Toledo, Ohio, recently held a testimonial dinner for nine employes who have served the company 25 years or more. A total of 265 years' service was represented by the group.

The Buda Co., Harvey, Ill., announces that Fred W. Sparks has joined the company as district representative to handle the Ohio territory for the manufacturer's engine division.

General Electric Co., Schenectady, N. Y., has appointed Robert W. Ferrell as manager of employee and community relations of the affiliated manufacturing companies department. L. R. Boulware, vice-president, is general manager of the department.

Gar Wood Industries, Inc., Wayne, Mich., has announced the appointment of Walter C. Robertson as vice-president in charge of exports, with headquarters at Wayne. He was formerly vice-president in charge of national accounts. E. B. Hill has been named general sales manager and R. F. Whitworth, general service manager. New regional managers are Ross Mill, San Francisco (western region); A. C. Berg, Wayne, Mich. (central region); W. G. Barrett, Boston, Mass. (northeast region); and H. C. Hatch, Washington, D. C. (southeast region). J. D. Towne has been appointed division manager and W. S. Blakeslee has been promoted to sales manager of the Wayne division. Promotions to district manager were also announced



McDERMOTT DRYER

Dry core sand is supplied the year around by the Standard Sand Co. at Grand Haven, Michigan, with a McDermott 5'x30' Rotary Dryer (like the one pictured above).

The sand, perfect for foundry casting, goes through the dryer at the rate of 60 tons per hour.

McDermott Rotary Dryers are used wherever sand, stone, slag or other similar products of reduced moisture content are required.

McDERMOTT BROS. COMPANY Allentown, Pa.

Manufacturers of Rotary Dryers, Kilns, Batchers, Stacks

Midwestern Representative

ASPHALT EQUIPMENT SALES CO.

430 E. Maple Rd. Blvd.

Indianapolis 5, Indiana

Blaw-Knox No. 667 rated ½ cu. yd. narrow hard digging bucket. Two-line lever arm type with counterweights.

THE BUSINESS END OF YOUR CRANE INVESTMENT

So, to insure the maximum returns on this investment, your bucket must get the most work done with the least crane time . . . From over 100 types and sizes of Blaw-Knox Buckets there's one that's *right* for your operations—it can be found in Blaw-Knox Catalog #2076.

YOUR GUIDE TO PROPER BUCKET SELECTION

BLAW-KNOX DIVISION

of Blaw-Knox Company

2035 Farmers Bank Bldg., Pittsburgh 22, Pa.

BLAW-KNOX BUCKETS

for H. N. Nelson, B. A. Cooper, E. R. Curry, W. D. Kerrick, R. J. Palmer, R. M. Steegman, D. C. Royce and W. R. Karll.

Hewitt Rubber Division, Hewitt-Robins, Inc., Buffalo, N. Y., announces the appointment of the Industrial Equipment Co., Louisville, Ky., as distributor of the division's entire line of industrial hose, belting and packing.

The Timken Roller Bearing Co., Canton, Ohio, has announced that William E. Bryden, sales engineer, Chicago, Ill., has been transferred to the Cincinnati office. He will be succeeded at Chicago by William T. Strickland, sales engineer. Announcement has also been made that the company has purchased the 8-acre site and taken over all construction on the new $150,000 rock bit plant at Colorado Springs, Colo., originally scheduled to be built by the Colorado Springs Chamber of Commerce and leased to the company. Frank M. Givin, general foreman of the Mount Vernon plant, has been named manager of the new unit, and William Matthews will be office manager, the same position he held at Mount Vernon. Delphia W. Hodge, foreman on Shift 1, has been named to succeed Mr. Givin as general foreman at Mount Vernon, and William Rowe, assistant foreman on Shift 1, will become general foreman of Shift 1. Hugh Price of the Canton office accounting department, has been appointed to succeed Mr. Matthews as office manager at Mount Vernon.

American Brake Shoe Co., New York, N. Y., has appointed N. George Belury as vice-president of the engineered castings division, and Harry C. Platt has been named works manager. The two new non-ferrous foundries at Niles, Ohio, and Meadville, Penn., have been completed and are now in production. The Meadville plant will produce bronze bearings and castings, and the Niles plant will manufacture railroad journal bearings.

Link-Belt Co., Chicago, Ill., announces that Columbus Basile has been appointed superintendent of the Caldwell plant in Chicago, and Leonard C. Heinlein has been named assistant superintendent of the ball and roller bearing division plant in Indianapolis. Peter Groustra, formerly district sales engineer at Detroit, has been appointed district sales manager in charge of the new sales office in Grand Rapids, Mich., and will be assisted by Herbert E. Wolf, who has been a member of the staff of the Ewart plant in Indianapolis.

Allis-Chalmers Mfg. Co., Milwaukee, Wis., has announced the appointment of A. J. Jorgensen as chief mechanical engineer and F. R. Gruner as mechanical research and development engineer of the basic industries department, and B. H. Puerner as manager of the department's crushing, cement and mining machinery section. C. E. Lacy, sales representative, has been transferred from the Atlanta office to the Birmingham of-

Now you can get Immediate Delivery on this 2 to 4 Hp. WISCONSIN Air-Cooled ENGINE

- Tremendously increased production capacity for our smaller sizes now enables us to offer our Models AB and AK engines (2 to 4 Hp) for immediate delivery — in *volume* to manufacturers of power-operated equipment, or through authorized distributors and dealers on individual purchases.

These are heavy-duty, 4-cycle single cylinder engines that carry "Most Hp. Hours" service ratings. Equipped with tapered roller bearings at BOTH ends of the drop-forged, dynamically balanced crankshaft for long life and protection against bearing failure; high tension outside magneto with impulse coupling for quick, easy starting in any weather; pump-circulated constant level splash lubrication system (no grease cups or oil fittings). Net weight: Model AB, 76 lbs.; Model AK, 77 lbs. Speed range: Model AB, 1600-2600 rpm; Model AK, 1600-2400 rpm.

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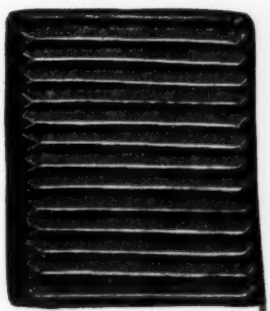

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1. Guaranteed to give the equivalent or better life than new crusher jaws.
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fice. At a recent meeting of the board, President Walter Geist said that during the war the company had planned for a postwar employment increase of 50 per cent, bringing the total employment to about 25,000, but that the present employment reached 31,000 with several plants seeking additional personnel.

Nagle Pumps, Chicago Heights, Ill., has announced the appointment of Charles L. Edwards as chief engineer. He was previously with the pump engineering department of the American Manganese Steel Division of American Brake Shoe Co.

Diesel Engine Manufacturers' Association, Chicago, Ill., announces that Gordon Lefebvre, president of Cooper-Bessemer Corp., has been elected president of the Association. Otto H. Fischer, president of The Union Diesel Engine Co., and J. W. Metzger, vice-president of The Baldwin Locomotive Works, were elected vice-presidents. Robert H. Morse, Jr., vice-president and general sales manager of Fairbanks, Morse & Co., was reelected treasurer, and Harvey T. Hill was reappointed executive director. Elected to serve two years on the board of directors were George W. Codrington, vice-president of General Motors Corp. and general manager of Cleveland Diesel Engine Division; E. J. Schwanhausser, vice-president of Worthington Pump & Machinery Corp.; A. W. McKinney, vice-president of The National Supply Co.; Mr. Morse, and Mr. Metzger. The following were elected to serve one year on the Board: C. S. Herbert, executive vice-president, Enterprise Engine & Foundry Co.; W. E. Corrigan, vice-president, American Locomotive Co.; Robert E. Friend, president of Nordberg Mfg. Co.; Mr. Lefebvre and Mr. Fischer.

Mack Trucks, Inc., New York, N: Y., has appointed W. E. Day as director of research. In assuming his new duties Mr. Day relinquishes the post of chief metallurgist as well as that of general foundry superintendent. Harold J. Fikejs has been named manager of the Milwaukee direct factory branch. He was formerly district wholesale manager at Des Moines.

Hercules Steel Products Corp., Galion, Ohio, announces the appointment of R. J. Nymberg of Detroit, Mich., as general sales manager. He was formerly associated with Gar Wood Industries, Inc., Wayne, Mich.

Atlas Equipment Corp., Pittsburgh, Penn., has appointed H. B. Wilson as sales engineer. He was formerly associated with the Public Roads Administration and the U. S. Army Engineers Corps at Washington, D. C., as a specialist in aggregates, bituminous paving and construction.

Swan-Finch Oil Corp., New York, N. Y., has announced the appointment of Anthony J. Zino, Jr., as assistant sales manager of the industrial sales division, with headquarters in New York.

C. F. Winchester, construction equipment manufacturers' representative, announces the removal of his office to the Denrike Building, 1010 Vermont Ave., N.W., Washington 5, D. C.

Allis-Chalmers Mfg. Co., Milwaukee, Wis., has named William M. Wallace as special assistant to G. V. Woody, manager of the basic industries department. He has served as a sales representative in the Denver and Pittsburgh offices, and more recently as an engineer in the basic industries department.

John A. Roebling's Sons Co., Trenton, N. J., announces the appointment of L. H. Van Dike, Jr., as Detroit, Mich., representative, replacing the late Harry T. Hirbe, who died on November 24.

Marion Power Shovel Co., Marion, Ohio, has announced the appointment of William F. Lanius as sales representative for the territory covered by Washington, Oregon, Idaho and Montana. He succeeds Joseph Reed who had represented that territory for the past seven years.

Andrews Agency, Milwaukee, Wis., has appointed J. G. Van de Loo as vice-president of the company. He was formerly assistant manager of Customer Relations Division of R. G.

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Portable and Stationary

BELT CONVEYORS
BUCKET ELEVATORS
CONVEYOR ROLLS
QUARRY PLANTS

LeTourneau, Inc., Peoria, Ill., and will continue to serve this company as account executive on the LeTourneau account.

Atlas Powder Co., Wilmington, Del., announces that Weston G. Frome, general manager of the explosives department and a member of the board of directors, has been elected a vice-president of the company. He will continue as head of the explosives department and as a member of the board.

Diamond Iron Works, Inc., Minneapolis, Minn., has appointed Clifford L. Vader as assistant general sales manager. Previous to joining the company in 1942, Mr. Vader spent 11 years with the Rosholt Co. as salesman of road-building machinery, followed by several years of partnership in the sewer, water and bridgebuilding firm of Theodore Jensen Co. and as superintendent of roadbuilding and heavy construction projects throughout the Northwest.

Clifford L. Vader

Maxon Construction Co., Inc., Dayton, Ohio, has announced the appointment of the following dealers to handle the sale and servicing of Dumpcrete bodies: Anderson Equipment Co., Omaha, Neb., State of Nebraska; Banks-Miller Supply Co., Huntington, W. Va., State of W. Va., except extreme eastern and panhandle counties; J. W. Bartholow Machinery Co., Dallas, Texas, northeastern section of Texas; and R. E. Brooks Co., New York City, covering metropolitan New York City including 11 counties in New Jersey.

Syntron Co., Homer City, Penn., has purchased the former H. K. Porter Co. shell plant at Blairsville, Penn., for manufacturing large, heavy duty vibratory feeders and conveying equipment. General offices and headquarters will remain at the Homer City plant.

Lima-Hamilton Corp., Lima, Ohio, has announced the appointment of W. D. Haley as district manager of the Pacific Northwest territory for the Lima shovel and crane division. R. G. Carter, former service engineer, has been named assistant service manager of the division.

Bemis Bro. Bag Co., St. Louis, Mo., announces that T. N. Barksdale, formerly in charge of the Baltimore sales office, has assumed new duties at the Memphis sales division which covers all of Tennessee and Mississippi and portions of five other states.

Elwell-Parker Electric Co., Cleveland, Ohio, announces that Ray Perin of the Ira G. Perin Co., west coast representative of Elwell-Parker trucks, has been elected president of the Materials Handling Association of northern California.

SYNTRON

CONSTRUCTION and MAINTENANCE TOOLS

"Gasoline Hammer"

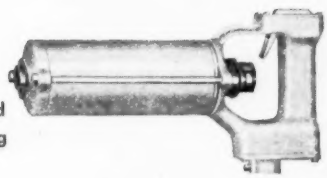
PAVING BREAKERS

100% Self Contained

Busting Concrete—Digging Clay, Shale, Hardpan, etc. Tamping Backfill—and a host of other jobs.

"Portable"

ELECTRIC HAMMERS



—for drilling, cutting, chipping concrete and masonry—scaling old paint and rust—vibrating forms.

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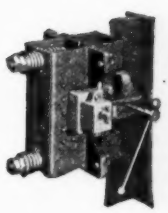
ELECTRIC DRILLS

3/16" to 1" capacity

External Concrete Form

VIBRATORS



Setting and compacting concrete in thin wall forms, pipe forms, standards, etc.

The industrial models can be applied to bins, hoppers and chutes to keep material free-flowing.

Save You Money and Time

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MANGANESE STEEL CASTINGS

for PULVERIZERS CRUSHERS ROLLS SCREENS

for SHOVELS DREDGES CRANES CONVEYORS

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Established 1881 CARLISLE, PA.

Made of Acid Open Hearth Steel Wire

Round Strand
Flattened Strand
Preformed
Steel Clad
Non-Rotating

The Service Record of this wire rope continues to make and hold friends.

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New FARREL-BACON
CRUSHER
has many advantages

Design features of this 36 x 30 E stone crusher include: (1) Meehanite frame, sectionalized when necessary; (2) removable water cooled bearings; (3) improved design of swing jaw bearing; (4) force-feed oil lubrication, or circulating system if desired; (5) split flywheels; (6) flat or V-belt drive.

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FARREL-BACON
ANSONIA, CONNECTICUT

Hammermills, Inc., St. Louis, Mo., has been organized by Charles M. Bindner and T. A. Oberhellmann for the manufacture of a complete line of hammermills for use in the cement and mining industries, etc. Mr. Bindner, president, was one of the organizers of the Dixie Machinery Mfg. Co. in 1918, and has also served as sales manager and secretary-treasurer. T. A. Oberhellmann, vice-president and chief engineer, has served for the past five years as chief engineer of Dixie Machinery Mfg. Co. The new company will also offer complete engineering service.

The Master Builders Co., Cleveland, Ohio, announces that Dr. Edward W. Scripture, Jr., vice-president in charge of research, has been decorated with the "Palmes Academiques" by the French Ambassador, Monsieur Henri Bonnet, on behalf of the French Government. This award was presented to Dr. Scripture "for services rendered to science," and resulted from his participation during the war in a scientific congress held in Paris at which he gave a paper on "Cement Dispersion."

The Thew Shovel Co., Cleveland, Ohio, has appointed Ed. C. Powers as head of the editorial service department, which has been established to keep the industry informed on Lorain shovels and cranes.

Thermoid Co., Trenton, N. J., announces that Jack Brand, formerly assistant sales manager for automotive replacement division at Trenton, will handle industrial sales for the State of Colorado, with headquarters at Denver. J. J. Chamberlain, formerly with Pioneer Rubber Mills of Calif. and the rubber division of Paramount Mfg. Co., will handle the State of Washington and the northern half of Oregon, with headquarters in Seattle. E. J. Dunlap has been transferred from Trenton to San Francisco, where he will have charge of the northern half of California and southern Oregon. A. Fred Matheis has been appointed industrial sales promotion manager, and H. William Overman, manager industrial friction materials division, has transferred his headquarters to Detroit, Mich. Jack Wright has been assigned industrial and oil field sales in Utah, Idaho, Wyoming, Montana and western Canada, with headquarters at Salt Lake City.

Johns-Manville Corp., New York, N. Y., has announced the purchase of Van Cleef Bros., Inc., Chicago, Ill., internationally known manufacturers of "Dutch Brand" industrial and automotive products, which will be operated as a subsidiary of Johns-Manville Corp. Noah Van Cleef will remain as president and treasurer and his two brothers, Felix and Paul, will continue as vice-presidents of sales and production, respectively.

International Harvester Co., Chicago, Ill., has promoted R. W. Maxwell to assistant branch manager at Buffalo, N. Y. He was formerly manager at Binghamton, N. Y. J. F. Adams, formerly assistant manager of the Charlotte, Tenn., motor truck branch, has been transferred to the Nashville branch as manager, succeeding J. P. Lauffer, who has resigned to enter business as an International Truck dealer at Columbia, Tenn.

Davey Compressor Co., Kent, Ohio, has appointed H. A. Pratt as parts and service manager. He was formerly superintendent of the Kent, Ohio, plant.

International Paper Co., New York, N. Y., announces the formation of the Bagpak division to handle the manufacture and sale of heavy-duty multiwall kraft paper bags, which was previously handled by two subsidiary companies, George and Sherrard Paper Co. and Bagpak, Inc., which have been dissolved, and by the company's former International Paper Products Division.

Chas. E. Parks, formerly assistant advertising manager of LaPlant-Choate Co. and Cummins Engine Co., is editor and publisher of "Construction Equipment Operator and Serviceman," a new monthly magazine for the man on the job. It will contain latest postwar information on new tools and equipment, teach job short cuts, show how to get maximum output and steadier performance from excavators, tractors, hauling units, pumps, etc. Headquarters of the magazine are in Cedar Rapids, Iowa.

Exhibitors Advisory Council, Inc., New York, N. Y., announces that the year 1948 will be a record one for trade shows and expositions. Listings covering all types of events total 718 for the first eight months as compared with 468 for the same period in 1947, an increase of more than 53 per cent. J. F. Apsey, Jr., advertising manager of The Black & Decker Mfg. Co., Towson, Md., is president of the Council.

American Hoist & Derrick Co., St. Paul. Minn., announces the promotion of John L. Beard to manager of the small products division, and the appointment of Steve C. Brown as advertising manager. For the past three years Mr. Brown operated his own advertising agency at Bowling Green, Ohio. Prior to that he was advertising manager of the Cleveland Tractor Co.

H. K. Porter Co., Inc., Pittsburgh, Penn., recently held a meeting at the William Penn Hotel, Pittsburgh, Penn., for the company's sales representatives from all parts of the country.

Ford Motor Co., Dearborn, Mich., has announced a reduction of approximately 10 per cent in the price of charcoal briquets manufactured at the Iron Mountain, Mich., plant.

Inland Steel Co., Chicago, Ill., has licensed the Youngstown Sheet & Tube Co., Youngstown, Ohio, to manufacture Hi-Steel, a development of the steel company.

Hewitt-Robins, Inc., Buffalo, N. Y., has announced the appointment of James D. Waser as manager of the molded goods sales, Hewitt Rubber Division; also the appointment of the St. Louis Railway Supply Co., St. Louis, Mo., as a distributor in the general St. Louis area.

Hamilton Rubber Mfg. Corp., Trenton, N. J., has opened a branch office and warehouse in Houston, Texas, under the direction of W. A. Olivier, who was recently appointed general manager of the Southern division. Lex O. Carmichael is assistant branch manager.

St. Regis Paper Co., New York, N. Y., announces that Samuel Shane, formerly with the *Wall Street Journal*, has joined the staff of Kenneth D. Lozier, vice-president of St. Regis Sales Corp., and will be engaged in public relations work in behalf of the St. Regis Paper Co., St. Regis Sales Corp., and St. Regis Paper Co. (Canada) Ltd., which has recently completed a new $450,000 multiwall paper bag plant at Vancouver, B. C.

General Electric Co., Schenectady, N. Y., has appointed C. H. Matson as manager of the Fort Wayne, Ind., works, and has divided the apparatus department into 15 divisions, each with its own manager, as follows: Schenectady, N. Y., turbine and gear, J. W. Belanger; control, K. R. VanTassel; large motor and generator, J. M. Crawford; small and medium motor, W. H. Henry; aeronautic and ordnance systems, W. C. Heckman; industrial heating, C. L. Ipsen; lighting and rectifier, A. F. Dickerson; wire and cable, B. F. Ilsley. Fort Wayne, Ind., fractional-horsepower motor, M. E. Lord; specialty transformer and ballast, W. C. Wichman. West Lynn, Mass., meter and instrument, N. M. DuChemin; aircraft gas turbine, H. D. Kelsey. Pittsfield, Mass., transformer and allied products, Robert Paxton. Philadelphia, Penn., switchgear, R. F. Tinnerholm. Erie, Penn., locomotive and car equipment, G. W. Wilson. Managers of apparatus department works in Schenectady, N. Y.; Lynn, Mass.; Erie, Penn.; and Oakland, Calif., will continue in their present positions.

Syntron Co., Homer City, Penn., has established a branch sales office in Montreal, Canada, at 4695 Sherbrooke St. West, under the supervision of C. F. A. Gray.

Allis-Chalmers Mfg. Co., Milwaukee, Wis., has organized a fifth sales region covering New York, Buffalo, Rochester, Syracuse and Newark, under the supervision of Arch J. Cooper, New York district office manager. Vernon L. Spinney has been appointed assistant district office manager. William J. Devers has been named Newark district office manager, while Ned W. Landis, formerly Syracuse branch manager, becomes a district manager. H. E. Weiss and Robert G. Burns continue as district manager of the Buffalo office and as special

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NO PULL OUT

With Cleveland Wire Screen Section Assemblies

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There is a CLEVELAND Wire Screen for every purpose.

• NO PULL-OUT
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• LONGER SCREEN LIFE
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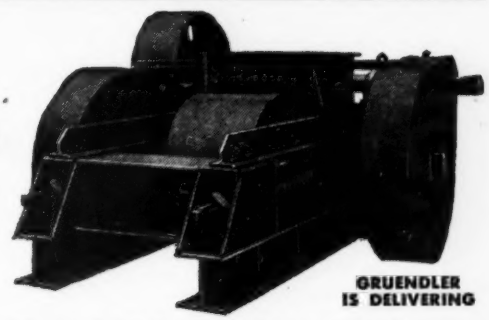
For Maximum Reduction, Economy, Production, and Safety
GRUENDLER ROLL CRUSHERS



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ST. LOUIS, U.S.A.

Built to the highest standards of quality and precision, includes enclosed all-gear drive—solid manganese shells—X-braced frame, roller bearings throughout—designed to take many times as much load as it will ever receive in service. You may choose smooth, corrugated, step tooth or a combination of any of these rolls in the proper diameters to produce the desired stage of reduction in combination with jaw or other primary crushers.

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2X Hammermills up to 15 tons per hr.
3X Hammermills up to 30 tons per hr.
4X Hammermills 50 to 150 tons per hr.
6X Heavy Duty Hammermills 200 to 500 tons per hr.
10x16-24x36 Jaw Crushers.
40x24 Double Roll Crusher—Smooth or Step Tooth.

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MFRS. of JAW CRUSHERS and HAMMER MILLS

Complete Portable and Stationary Plants

GRUENDLER

CRUSHER and PULVERIZER CO. • ST. LOUIS 6, MISSOURI

representative of the Rochester office, respectively.

International Paper Co., New York, N. Y., has opened a branch sales office in New Orleans, La., with H. Currie as district sales manager.

Fairbanks, Morse & Co., Chicago, Ill., has anounced the appointment of V. O. Harkness as manager of the Boston branch, and T. M. Robie of Chicago as manager of the general Diesel sales division. J. C. Elmburg, manager of the Boston branch, has been transferred to Atlanta, Ga., in a similar position. He replaces G. N. Van Epps who has resigned.

Bemis Bro. Bag Co., St. Louis, Mo., announces that Harvey W. Clements, manager of the Chicago general sales office, was guest of honor recently at a dinner celebrating his 35 years of service with the company.

Plans for expanding the Minneapolis plant were also announced. The plant will be located in Hopkins, a suburb of Minneapolis, and W. J. Geimer will be manager.

Raybestos-Manhattan, Inc., Passaic, N. J., is now manufacturing the largest brake lining for 22-ft. brake drums ever made, for use in Europe on the hoists of rehabilitated mines destroyed during the war.

L. B. Foster Co., New York, N. Y., has opened offices and warehouses in Houston, Texas, with Jerome B. Strauss as manager, serving Texas, Louisiana, Mississippi, Arkansas, Oklahoma, New Mexico, Arizona, Utah, and Colorado.

Enterprise Engine & Foundry Co., San Francisco, Calif., announces that the company has acquired the complete line of Hendy marine and stationary Diesel engines formerly manufactured by the Joshua Hendy Iron Works of Sunnyvale, Calif.

Bailey Meter Co., Cleveland, Ohio, announces that the last members of the 1946-47 Cadet Engineering Class have been assigned to branch offices. J. H. Wilson has reported to Cincinnati and R. W. May to New York.

Bemis Bro. Bag Co., St. Louis, Mo., announces that C. W. Loomis, manager of the Memphis, Tenn., plant since 1931, has been transferred to St. Louis to assume important administrative duties at the general offices. F. C. Chenault, sales manager at Memphis, will succeed Mr. Loomis as manager, and R. R. Duff, now in the market research department in St. Louis, will succeed Mr. Chenault as sales manager at Memphis.

St. Regis Paper Co., New York, N. Y., has announced the appointment of Francis G. LaFave as manager of the Watertown, N. Y., multiwall paper bag plant.

Chevrolet Motor Division, General Motors Corp., Detroit, Mich., has announced the appointment of T. C. Mallon as assistant manager of the commercial and truck department.

Babcock & Wilcox Co., New York, N. Y., has appointed the Portilla Corp., San Juan 15, Puero Rico, P. I., as agent in Puerto Rico and adjacent islands, succeeding H. Clyde Gregory, Inc.

Towmotor Corp., Cleveland, Ohio, has advanced Charles Edgar Smith to the newly created position of executive vice-president. He has been vice-president since 1943.

Allis-Chalmers Mfg. Co., Milwaukee, Wis., has undertaken a nationwide scrap iron salvage drive in an effort to meet the very critical scrap iron needs of American industry.

Worthington Pump & Machinery Corp., Harrison, N. J., has announced the appointment of A. W. Soutter as purchasing engineer of the Holyoke, Mass., works, with E. E. Foote as his assistant; O. J. Schorer succeeds Mr. Soutter as engineering assistant to Herman J. Schorle, works manager at Holyoke; P. H. Nash will take Mr. Schorer's position as chief engineer of the rock drill and air tool division; F. G. Riedel has been appointed chief engineer of the Freon compressor division, retaining his title of works director of all research; and Justin Neuhoff has been named chief engineer of the air conditioning and condensing units division.

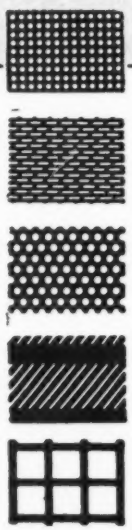
Raybestos-Manhattan, Inc., Passaic, N. J., reports that E. A. Wales, sales manager of the equipment sales division, Chicago, Ill., is on a brief leave

Keep your conveyors in perfect working order with *Cedarapids Conveyor Idlers*

Cedarapids conveyor idlers are ideal for portable or stationary setups. Permanently sealed and lubricated for life, heavy duty, single row, self-aligning ball bearings require no maintenance. Idler rolls are of heavy gauge steel tubing to insure perfect and constant balance. Self-cleaning angle iron base provides plenty of strength and prevents building up of material that would stop rolls from turning freely. Strong, stubby spindles eliminate breakage usually encountered with long threaded shafts. And, best of all, they're ready for immediate shipment. Available in all standard sizes. 10 different standard sizes in stock. Write today.

IOWA MANUFACTURING CO.
Cedar Rapids, Iowa, U.S.A.

Perforated Metals



REMEMBER—for screening, guarding, ventilating, etc., **Perforated Metals** are stronger, dependably accurate longer and insure long-range economy.

REMEMBER also—that H & K offers you 65 years accumulated experience in precision perforating of metals, as well as plywoods, plastics, fabrikoids and other materials. H & K, too, offers you a wide selection of sizes, shapes and spacings. Send your specifications NOW for complete information.

Don't Forget—H&K "Make Your Own" Safety Guards . . . strong, safe, inexpensive. Ask about them!

The Harrington & King Perforating Co.
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of absence to recuperate from a recent illness.

American Standards Association, New York, N. Y., announces that Auguste G. Pratt, president of The Babcock & Wilcox Co., New York, N. Y., has been elected to the board of directors of the Association to represent the American Society of Mechanical Engineers.

Westinghouse Electric Corp., Pittsburgh, Penn., has appointed C. B. Stainback as industrial syndicate manager, and John E. Payne as headquarters industrial sales manager.

Hercules Steel Products Co., Galion, Ohio, has announced the appointment of Jack C. Gay as sales engineer for the territory east of the Mississippi, while Vernon R. Teasley has been named West Coast representative.

Salem Tool Co., Salem, Ohio, has appointed the following distributors: West Virginia Supply & Equipment Co., Clarksburg, W. Va.; W. W. Williams Co., Columbus, Ohio; A. T. Green Machinery Co., Pittsburgh, Penn.; Rish Equipment Co., Roanoke, Va., and Charleston, W. Va.; Diamond Supply Co., Evansville, Ind.; and O. D. Lindstrom Equipment Co., Birmingham, Ala.

Caterpillar Tractor Co., Peoria, Ill., announces that C. A. Barabe, assistant Eastern Division sales manager, has been on a six-month medical leave of absence, and W. N. Foster, division district representative, has been promoted to the assistant managership. Mr. Barabe has been with the company since 1937. He served in the U. S. Army during World War II in the North African, Sicilian and Italian campaigns and was severely wounded on Anzio beachhead in Italy.

Farrel-Birmingham Co., Inc., Ansonia, Conn., has appointed D. K. MacLean as export manager for all lines of machinery, with headquarters in Ansonia, Conn. Mr. MacLean will also continue his duties as manager of the sugar mill machinery sales department, a position he has held since 1929.

New Incorporations

Cedar Park Quarries, Inc., San Antonio, Texas, has been incorporated, with a capital stock of $60,000, by W. G. Duncan, Gladys Brewer and A. T. Sibley.

Montgomery Limestone Co., Montgomery, Ala., has filed articles of incorporation, listing a capital stock of $10,000. Officers of the company are: Lucille H. Spidle, president; W. G. Williams, vice-president; and Jack Crenshaw, secretary.

Cayuga Industries, Inc., Cayuga, Wis., was incorporated recently with 500 shares, par value $50, and a minimum capital of $5000 to deal in all wood materials used in the building industry and for the manufacture of concrete products. Principals are Anna Beil, Paul A. and Hildegard B. Eimerman.

Hay & Peabody Cement Vault Co., Watertown, Mass., has been incorporated for the engineering, designing, manufacturing and installing of burial vaults, with 100,000 common shares, par value $1. Corporation officers are: Harold N. Jenkins, president; Norman H. Payne, treasurer; and F. William Andres, clerk.

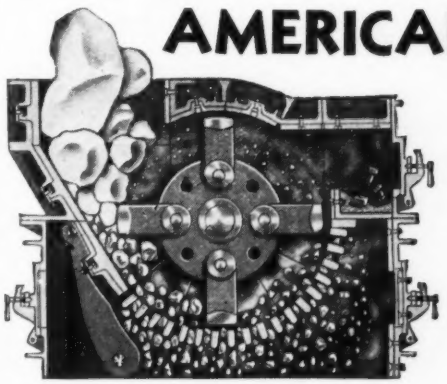
ACE PLASTERING CO., Newport, Ky., has been incorporated listing 100 shares, no par value. Erwin J. Klein and Madeline K., George W., and Anna Connley are principals.

DOE RUN INDUSTRIES, INC., Brandenburg, Ky., has been formed with a capital of $10,000 to engage in mining and quarrying. Juanita Board Brunton and William J., Naomi Ruth and Thomas Z. Board are incorporators.

RICHARDS SAND AND GRAVEL CO., Waco, Texas, has been incorporated by Frank E. Richards, L. T. Murray and T. Champe Fitzhugh, Jr. Capital stock was listed as $45,000.

MAERTENS SAND AND GRAVEL CO., Detroit, Mich., has filed articles of incorporation, with Joseph Maertens, Sr., as incorporator.

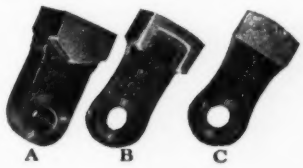
CORDOVA QUARRY, INC., Moline, Ill., dealing in limestone and other stone has been incorporated by Earl A. Collinson, Judson V. Collinson, and Melvin D. Collinson.



A—"Brute" for heavy reduction. B.—"Broadhead" for medium reduction. C—"Splitter" for fine reduction.

AMERICAN "ACS" Hammermills

for Compactness and Flexibility in Heavy-Duty Operation . . . . .



A B C

Rapidly crushes any hardness of stone with uniform, individual size control. Assures a round or cubical product free of fingerstones and slivers. Conventional front feed produces a coarser finished product with reduced fines. Center feed hopper feeds stone to utilize upper crushing chamber for rapidity of impact and a finer finished product. Available with any of three types of hammers. Capacities up to 250 TPH.

Send for this free booklet

American PULVERIZER COMPANY

Originators and Manufacturers of Ring Crushers and Pulverizers

1245 MACKLIND AVE.
ST. LOUIS, 10, MO.

WANNA MAKE A BET?

. . . That the UNIVERSAL, dollar for dollar, and no holds barred, is the best Vibrating Screen you'll see in operation this year?

Write for catalog No. 107 today, and discover why hundreds of operators have profited by screening the UNIVERSAL way!

Type "MR" 42"x96" Double Deck

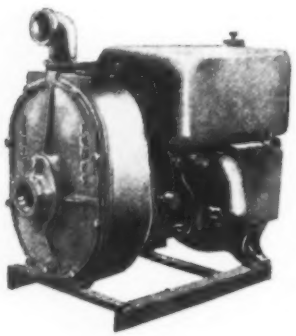
★ ★ ★ UNIVERSAL VIBRATING SCREEN CO. ★ ★ ★
RACINE - - WISCONSIN

MARLOW & CARVER PUMPS

2 INCH 4 INCH 6 INCH

NEW!

U. S. Government SURPLUS for IMMEDIATE DELIVERY—At Prices Far Below their Actual Cost

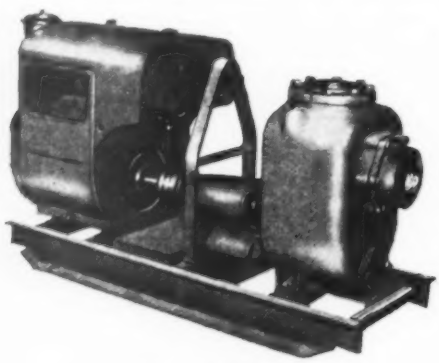


2" MARLOW

Self Priming Centrifugal Pump
Kiekhaefer Mercury Gasoline Eng.—3½ H.P.
Output—55 Gal. per Min. at 50 ft. Head

4" CARVER

Single Stage Centrifugal Pump
Wisconsin Gasoline Eng.—9-10 H.P.
Output—200 Gal. per Min. at 100 ft. Head



6" CARVER

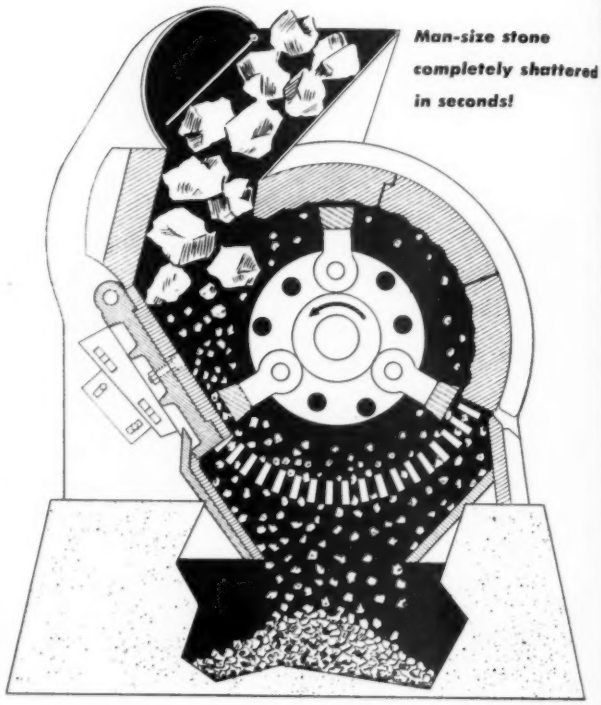
Self Priming Centrifugal Pump
Wisconsin Gasoline Eng. 22 H.P. or
Standard Make Electric Motor
Output—525 Gal. per Min. at 100 ft. Head

BENJAMIN'S FOR MOTORS
2124 MILL AVENUE
BROOKLYN 10, NEW YORK

Get up to 75 tons per hr.

With

Small Investment!



It's the Famous DAY Pulverizer - Crusher!

DAY pulverizers are engineered for crushing *profits* . . . They are known and used all over the world, primarily because of (1) low investment, (2) high volume, (3) long life and dependability, and (4) easy access. The No. 70 Swing Hammer pulverizer, illustrated above, has a wide crushing range . . . in many instances serves the purpose of two or more crushers of other types. That's why we call it a Pulverizer-Crusher! It reduces run-of-mine rock to either road stone or to finely pulverized material, in one operation. DAY Pulverizer-Crushers available in 5 sizes—capacity, from 1 to 75 tons per hour.

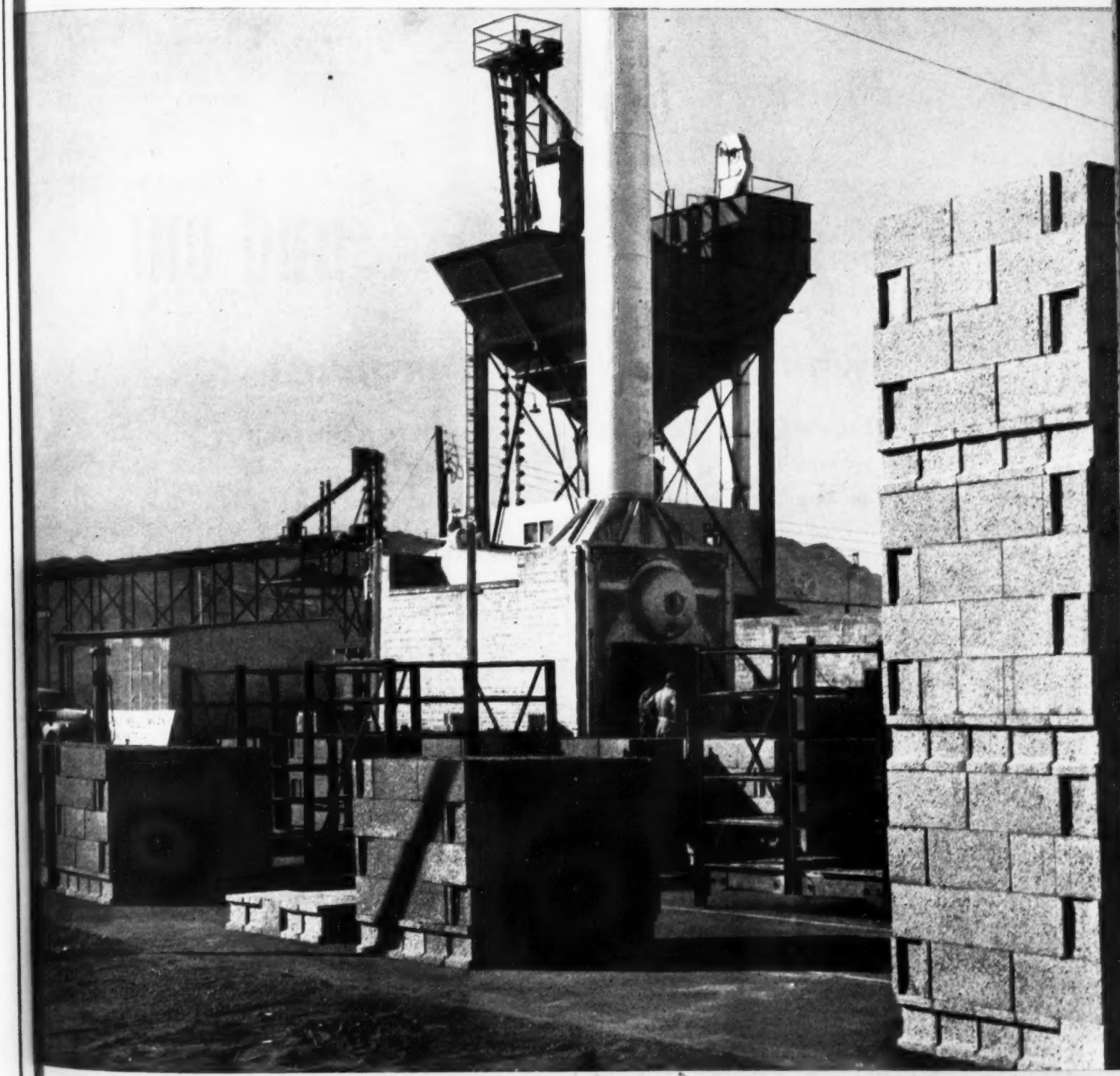
Write for fully illustrated catalog

Brooks Equipment & Mfg. Co.

Distributors in all Principal Cities

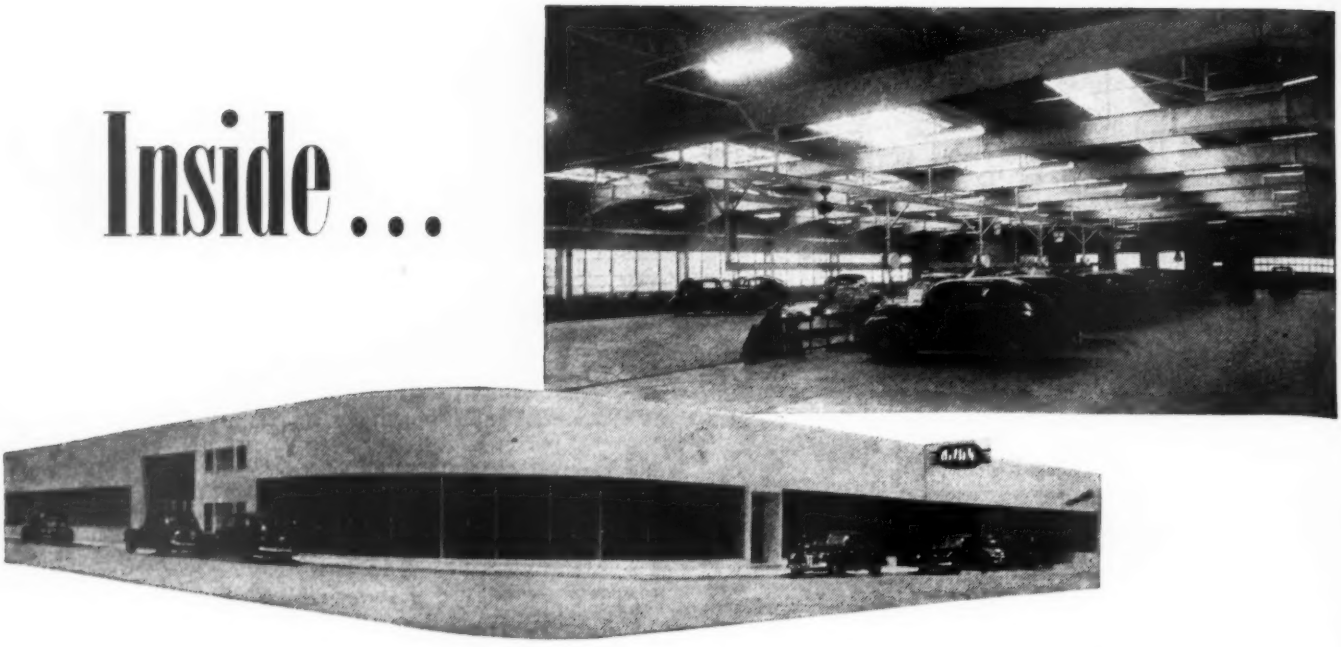
101 DAVENPORT RD. ● KNOXVILLE, TENN.

CONCRETE PRODUCTS



• One of the most modern concrete products plants in the South is operated by the Atlas Lime Co., El Paso, Texas

Inside...



Bird-Kultgen Ford Sales & Service Building, Waco, Texas. Engineer and Architect, H. L. Spicer; Contractor, C. C. Ramsey; Concrete furnished by Waco Ready Mix Concrete Co. and Clark Transit Mix Concrete Co., all of Waco, Texas.

...and out

"...well pleased with Duraplastic in every respect," reports contractor

And he goes on to say that he particularly liked the ease with which Duraplastic concrete was placed and finished.

Characteristically, Atlas Duraplastic air-entraining portland cement required less water. It provided better workability and placeability. It made a more plastic, more uniform and more cohesive mix. Bleeding and segregation were reduced. There were no "honeycomb" spots or streaks.

These advantages are typical of Duraplastic's performance—whether for paving, structural or mass concrete. Its use requires no unusual changes in methods—just the same good workmanship and careful supervision regularly employed.

Duraplastic complies with ASTM and Federal specifications...sells at the same price as regular cement...makes better concrete at no extra cost.

Send for further information. Write to Universal Atlas Cement Company (United States Steel Corporation Subsidiary), Chrysler Building, New York 17, N. Y.

OFFICES: Albany, Birmingham, Boston, Chicago, Cleveland, Dayton, Des Moines, Duluth, Kansas City, Minneapolis, New York, Philadelphia, Pittsburgh, St. Louis, Waco.

RP-D-86

ATLAS DURAPLASTIC TRADE MARK REG. U. A. C. CO.

AIR-ENTRAINING PORTLAND CEMENT

MAKES BETTER CONCRETE AT NO EXTRA COST

"THE THEATRE GUILD ON THE AIR"—*Sponsored by U. S. Steel Subsidiaries—Sunday Evenings—ABC Network*

INDUSTRY NEWS

DUBUQUE READY-MIX CONCRETE CO., Dubuque, Iowa, constructed last May at a cost of $150,000, is now adding heating facilities to provide year-round ready-mix service. Floyd G. Rubey is plant manager.

H. W. RATZ recently purchased the interest of his partner, Stanley Marsh, in the Valley Falls Block Co., Valley Falls, Kan., and will continue the manufacture of concrete building blocks.

WAUKESHA READY-MIXED CONCRETE CO., Waukesha, Wis., has been incorporated with a minimum capital of $10,000 to manufacture and deal in cement of all kinds, concrete, sand, gravel, and natural and artificial stones. C. L. Hendler, G. Nahrath and Carl Mueller are the principals.

ROCK ISLAND LUMBER READY-MIXED CONCRETE PLANT, Independence, Kan., has been completed and is batching two yards of material per each five minute period. H. G. Williams, manager of the Rock Island Lumber Co., is also manager of the concrete plant, with Clarence Morrow as superintendent.

MARVEL'S DUNBRIK PLANT, Alta, Iowa, has been completed and is now producing concrete brick at the rate of 12,000 per day. Marvel Anderson is the owner.

REARDON INDUSTRIES, Cincinnati, Ohio, makers of colors and chemicals for concrete, has announced a new brilliant red color for concrete floors, roads, and block.

RAY BUCK, WILLIAM HARRIS AND LIOYD TRANBER, owners of the Dassel Block Co., Dassel, Minn., have started the manufacture of concrete building block at the rate of 400 per day. This will be increased to 700 per day shortly.

POSTON BRICK AND CONCRETE PRODUCTS CO., Springfield, Ill., has opened its new $75,000 "Transit-Mix" concrete plant and is now making deliveries with a fleet of ten trucks. Emmett Poston is president.

CONCRETE CONSTRUCTION CO., Columbia, S. C., featured a movie on "Professional Driving" at a recent safety meeting.

BARNEY & DICKENSON, INC., Vestal, N. Y., has opened a new ready mixed concrete plant which also handles sand and gravel and cinder block.

METZGER HOLLOSTONE PRODUCE CO., West Bend, Iowa, has started the manufacture of concrete block under the management of Ben Metzger.

LAFAYETTE COUNTY Farm Extension Service and the Portland Cement Association, Missouri, recently held a septic tank demonstration near Lexington, Mo. Fred Venick of the Portland Cement Association supervised the construction of the tank which was built to specifications recommended by the Missouri College of Agriculture.

THE WISHEK CONCRETE PRODUCTS AND LUMBER CO., Wishek, N. D., has started the manufacture of concrete block. The new plant was put in operation by the Wishek Investment Co.

SELAH JAYNE has started the manufacture of concrete block at Sayville, N. Y.

CHARLES A. BUNCH, INC., manufacturer of concrete block, expects to double capacity with the erection of three new kilns, making a total of seven kilns at the plant.

CONCRETE PRODUCTS SUPPLY CO., Minneapolis, Minn., a company representing manufacturers of equipment and materials to be used or sold by concrete products plants, has been opened by Don Lang and LeRoy Nelson. Both men formerly were on the staff of a midwestern contractor's and engineer's publication.

HAVRE READY-MIX CONCRETE CO., Havre, Mont., will be in full operation next Spring following the installation of new equipment now on order, it has been announced by owners, Joe H. Sohm, George W. Snyder and Walter B. Mack. Capacity will be 240 yd. of concrete per 8 hrs. Announcement also has been made that the Havre Sand and Gravel Co., of which Fritz Naber is proprietor, is installing a new gravel washing and screening plant. The Ready-Mix company receives its gravel from the Naber firm.

Water-Repellent

PROTECTION PRODUCTS MANUFACTURING CO., Kalamazoo, Mich., has brought out a masonry water-repellent, known as Rainchek. The manufacturer claims that this product works its way into the most minute channels in the masonry, and spreads a protective film that repels water. It is said that the water-repellent will not evaporate from the material it is applied to; nor will it wash away, because it strikes into the concrete or masonry and becomes a part of it.

Concrete Slide Rule

PRECISION INSTRUMENT SALES CO., St. Louis, Mo., has announced that it is now marketing a concrete quantity slide rule calculator manufactured by Slide Rule & Scale Engineering Co. This rule has been used extensively by contractors and also has been distributed by ready mixed concrete producers to customers.

Mountain Area Cement Supply Short

BECAUSE OF A serious shortage of portland cement in the mountain area, residents of 20 new subdivisions in Salt Lake City, Utah, face a winter with no paved streets or gutters. In an attempt to alleviate the situation city officials and local cement producers met recently with Arch G. Webb, secretary of the Utah Home Builders Ass'n.

It was pointed out at the meeting that construction of a new cement plant near Salt Lake City has been delayed and because of this the intermountain area likely will not be fully supplied with the material for another year. Harry B. Roberts, sales manager for Union Portland Cement Co., said the plant cannot be completed before next July. Being built at a cost of approximately $4,000,000, the new plant will have a daily capacity of 16,000 sacks when finished.

E. P. Snow, plant superintendent of Portland Cement Co. of Utah, only other Utah cement manufacturer, said his firm contemplates no expansion and attributed the cement shortage to innumerable small jobs such as cement brick, pipe, and prefabricated cement industries which are demanding more and more of the product.

Mr. Webb said his office would do everything possible to help the city with its problem, but added that most contractors are faced with the shortage. Those who do have cement are importing it from California and because of this the cost is above home producers' prices.

Build Additional Kiln Space

IN ORDER TO OPERATE more efficiently and increase block production to keep pace with increased demand, two additional kilns are being added to the plant of Anchor Concrete Products, Inc., Buffalo, N. Y. (ROCK PRODUCTS, June, 1947). The new kilns are identical to those described in the previous article. Frederick Reinhold, president, reports that the demand for Flexicore units also has increased.

Redi-Furred Block

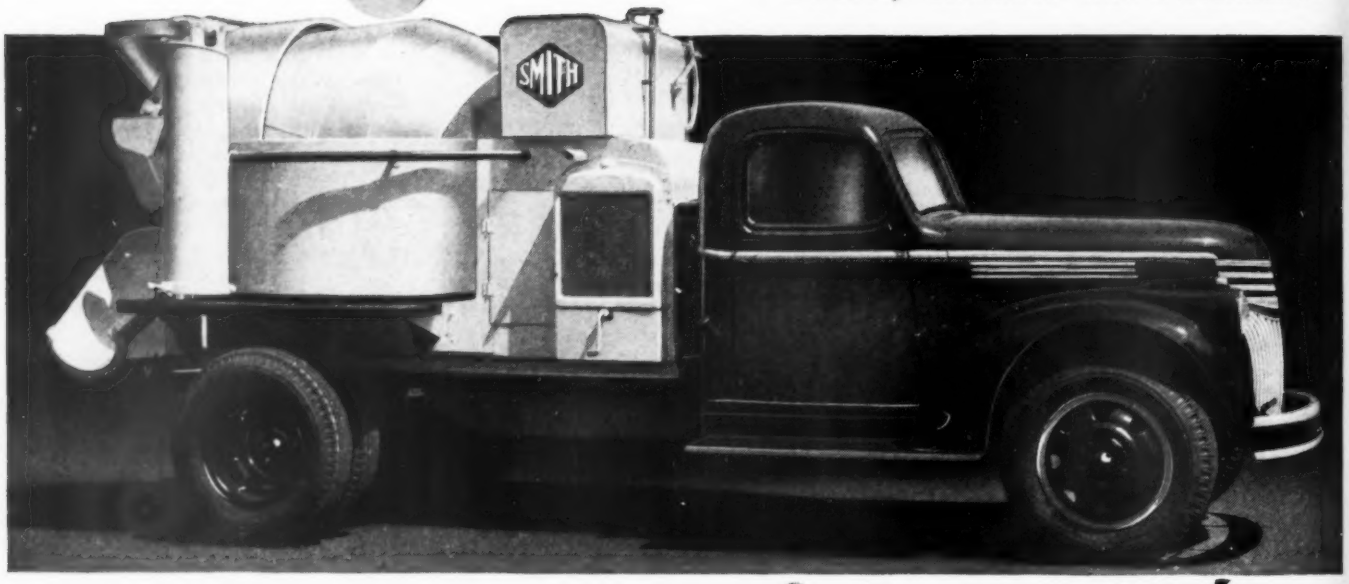
POTTER BLOCKS, Cincinnati, Ohio, recently demonstrated its new Redi-Furred block, a material that provides part insulation and can be used either for outside walls or for backing, as plaster may be applied to it directly. The company spent approximately $50,000 on its factory for the making of the block.

Manufacture Vaults

ST. JOSEPH WILBERT VAULT CO., St. Joseph, Mo., has started the manufacture of burial vaults. C. F. Sloan is owner of the company, and Henry Hilton is manager.

Where Else can you find a Truck Mixer with so many Profit Making FEATURES

- Dual Water Injection System
- Cold Weather Protection for Water System
- No Water Bell or Nozzle Inside Drum
- Gravity Flow Feed Chute Charging
- No Leaky Loading Hatches
- Real Visible Mixing
- Larger Drum — Increased Capacity
- Lower Weight — Bigger Pay Loads
- High Discharge Directly into Forms
- Controlled Slow or Fast Discharge
- Perfected Drum Closing Door and Seal
- Famous Smith "End-to-End" Mixing Action
- Direct Connected Motor with 3-Point Suspension
- Improved Transmission Cushioned in Rubber
- Beauty Combined with Performance



YES—DELIVERIES ARE BEING STEPPED UP!

Smith-Mobile Truck Mixers and Agitators are available in four popular sizes. Naturally the demand for these improved models is still greater than the supply. But deliveries are being stepped up by greatly increased production. Before you buy new truck mixer equipment, be sure to investigate Smith-Mobile's many profit-making features.

THE T. L. SMITH COMPANY
2885 N. 32nd Street, Milwaukee 10, Wisconsin

Get the Facts!

A new Smith-Mobile bulletin is now available. It gives you complete description, dimensions and specifications of the improved Smith-Mobile models. If you haven't already received a copy of this new bulletin—write for one.

SMITH MOBILE

The Original High Discharge Truck Mixer and Agitator

Leaders in the Industry ★

USE BESSER VIBRAPACS!

(Left to right) Messrs. Bageman and Wailes, owners of Wailes-Bageman Co.

★ This is the 63rd of a series of advertisements featuring some of the leaders of the Concrete Products Industry who are today stepping up block production with Besser Super Vibrapacs. Other leaders will be featured in subsequent issues.

Wailes-Bageman Co., Los Angeles Now Operates 3 Super Vibrapacs in "Air-conditioned" Plant

About a year ago, Wailes-Bageman Company, Los Angeles, California, installed their first Besser Super Vibrapac Machine. Since then the company has added two more Super Vibrapacs. Due to the mild California weather, the plant is open on the sides, providing ideal working conditions for that climate.

Before the War, Wailes-Bageman was a large manufacturer of Flexicore Concrete floor systems. During hostilities, they made pontoons for the U. S. Navy. Now the plant is re-converted to the production of concrete block in addition to the concrete floor systems.

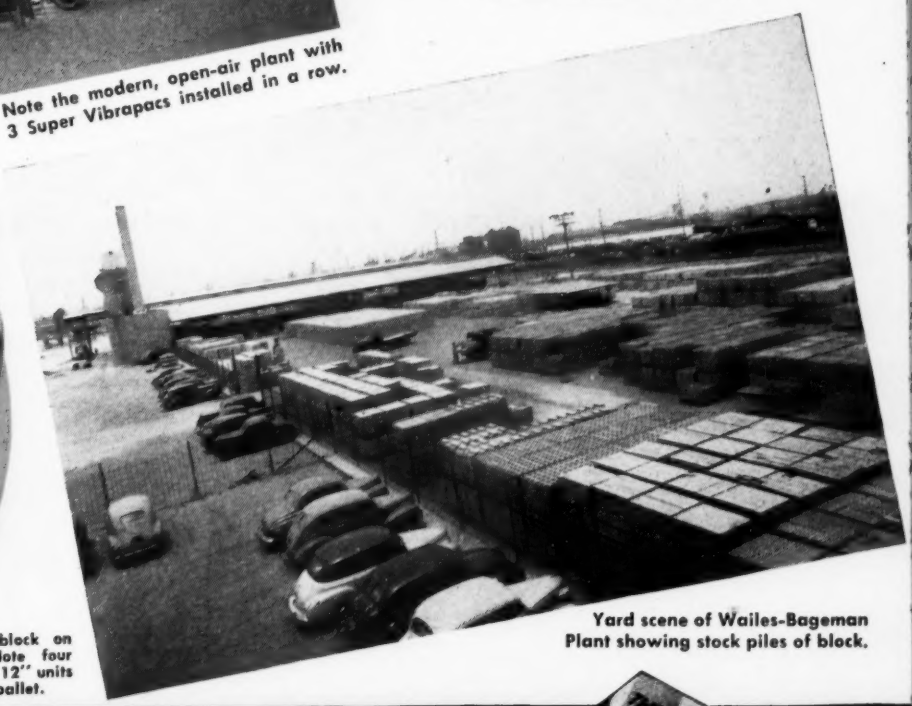
The popular masonry unit in Southern California is a 4"x8"x12", 16 lb. block. Four of these units are produced at a time on one plain pallet. This gives Wailes-Bageman a capacity production of 19,200 units per 8-hour day.

3 machines . . . 19,200 high-quality block . . . and no machine operator required. Only one man is needed at each machine to operate the off-bearing hoist. That's what we call economical block production.

BESSER MANUFACTURING CO.
ALPENA, MICHIGAN, U. S. A.

Note the modern, open-air plant with 3 Super Vibrapacs installed in a row.

Placing block on rack. Note four 4" x 8" x 12" units on each pallet.



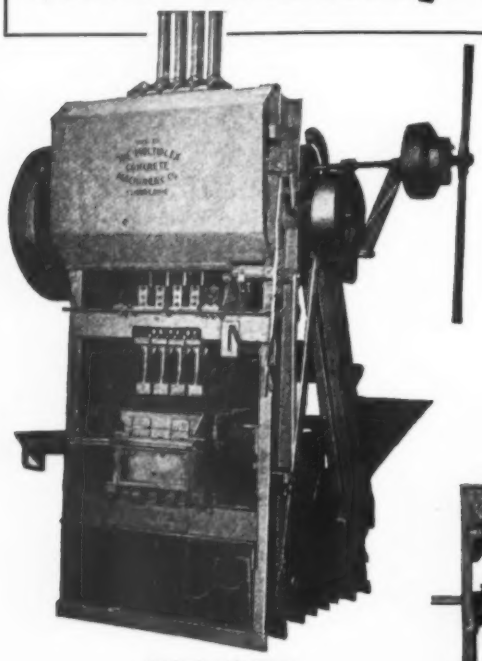
Yard scene of Wailes-Bageman Plant showing stock piles of block.

BESSER PLAIN PALLET VIBRAPACS

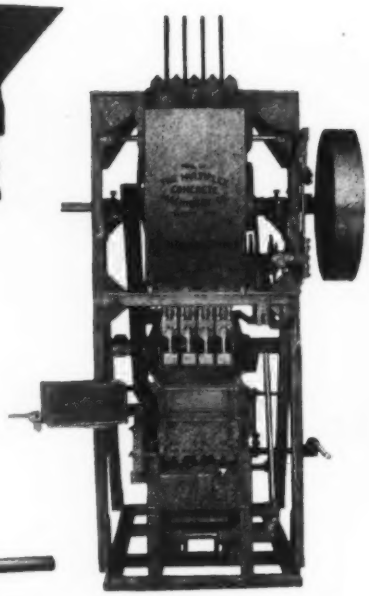
THE SAVING IN PALLET COST WILL PAY FOR A BESSER VIBRAPAC PLAIN PALLET STRIPPER

Quality Counted Most Then . . . and Quality Still Counts Most Today

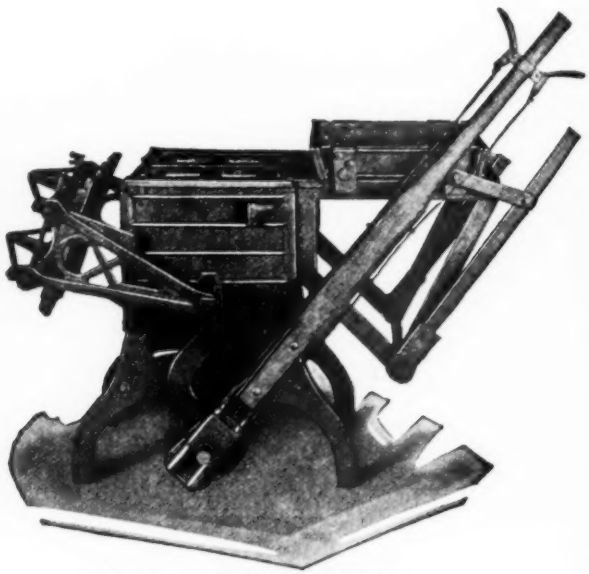
From our founding in 1906, as the nation's first producer of complete block-making equipment, we have never compromised with quality — not even in these days of overwhelming demand for Multiplex units. With our new plant in full production at Oak Harbor, Ohio, we are delivering many more machines than ever before, and we're delivering them *complete with traditional Multiplex quality.*



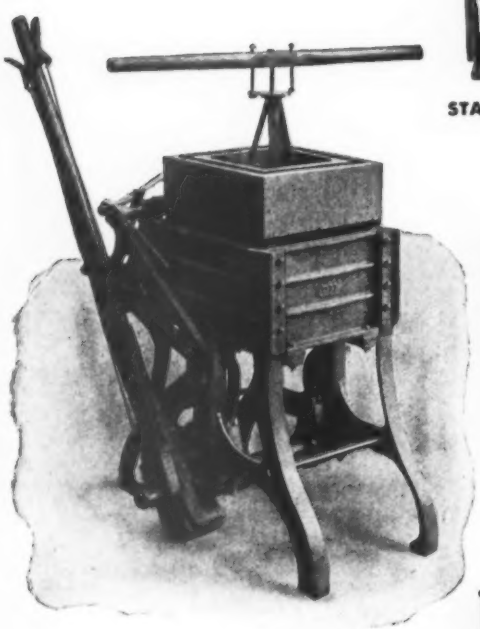
SUPER TAMPER



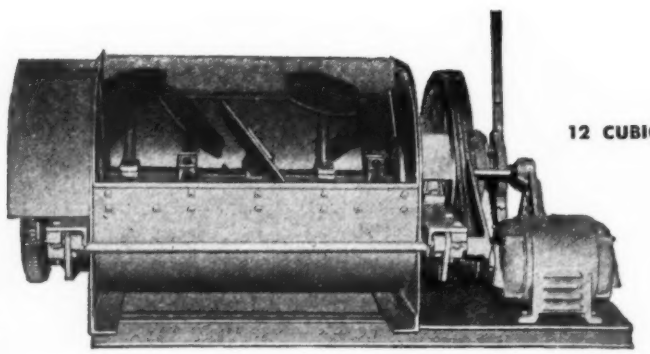
STANDARD STRAIGHT 8



MODEL C-1 DOUBLE STRIPPER



MODEL F FLUE BLOCK MACHINE



12 CUBIC FEET V-BELT DRIVE

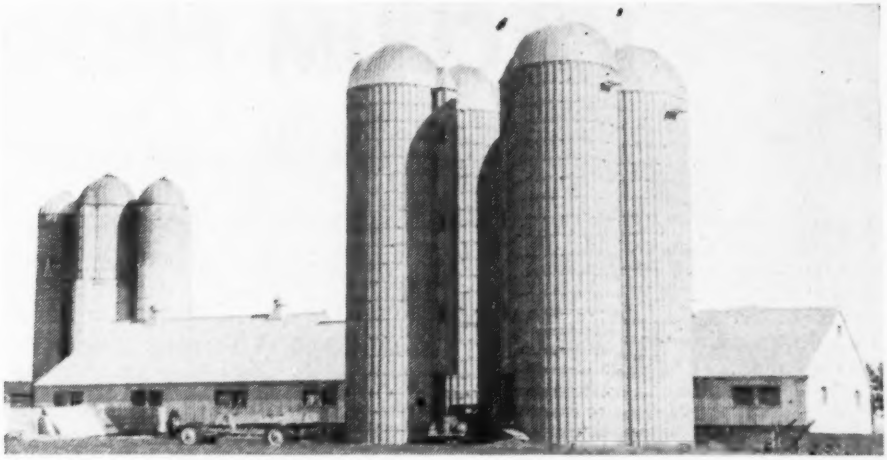
MULTIPLEX CONCRETE MACHINERY CO.

Specializing in Complete Concrete Plant Equipment Since 1906

ELMORE OHIO

Year's backlog of orders faces Mason & Lawrence, Elgin, Ill., as the demand for concrete staves increases in Mid-West

By DAVID MOCINE



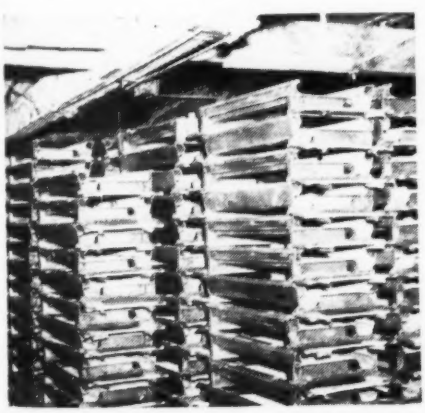
Modern dairy barn and concrete stave silos

Keep Workmen Busy the Year Round

PRECAST reinforced concrete staves for silo construction, manufactured by Mason & Lawrence, Elgin, Ill., were first patented in 1914, with the latest renewal dated 1939. Seven additional concrete products manufacturers in the mid-west are licensed to manufacture these silo staves under a royalty plan.

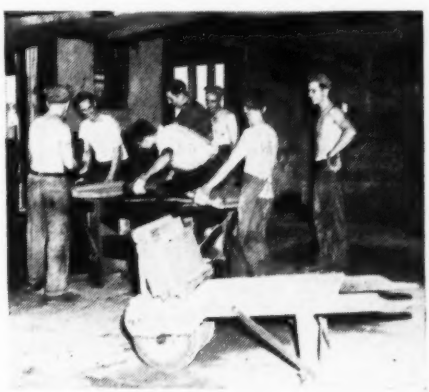
Facing a business street, the plant is located on sloping ground, the rear or lower end fronting on a railroad siding with a car-height concrete loading dock paralleling the tracks. Between the tracks and main plant building are two concrete stave silos used for live storage of aggregate, with a bucket elevator, 48 ft. centers, between them. Aggregate is fed to the elevator from a below-track level hopper that may be filled either by rail car or truck, and a flop gate at the top of the elevator diverts sand to one silo and gravel to the other. The plant uses ¼- to ⅜-in. pea gravel and natural sand, processed locally.

In the plant building near the base of the aggregate silos is a hand-charged stationary concrete mixer.



Storeroom containing cleaned, oiled forms with reinforcing in place, ready for the pouring

Using sacked regular portland cement, the company has found that the strongest concrete is made by mixing for three minutes. Stave forms on a vibrating table are manually filled, with the pouring operation usually taking four hours at the rate of 200 forms per hour. The newly filled forms



Stripping silo staves. Note rolled canvas curtain, above, for winter curing with heat

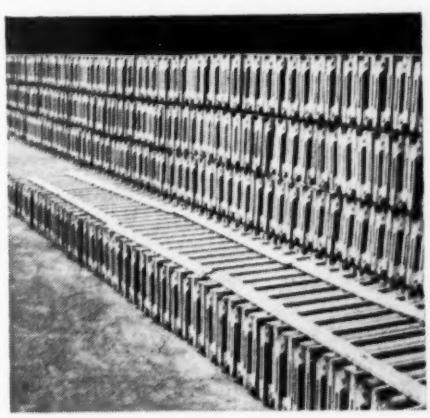
remain in the plant building overnight, being stripped the next morning and stacked in the yard for 15 to 20 days before delivery. On particularly cold winter days, heavy canvas curtains are dropped around the poured forms while still in the plant, and heat is introduced by a blower drawing warm air from a coal fired furnace through a duct. This same furnace is used to heat mix water in the winter season.

Immediately after stripping is completed, the entire crew cleans the forms with wire brushes and burlap pads. The forms are then oiled with a 6-in. paint brush, and reinforcing rods placed preparatory to pouring. In order to speed the oiling operation, a compressed air oil spray was tried, but it was found that the hand method was the only way to assure complete penetration of the oil to all corners and under the overhang of the form. The plant employs 15 men on a year round basis.

Staves are formed in flat sections measuring 12- x 30-in. by 2½-in. thick, with the curvature of the completed silo being taken care of by the slight angle made at the joint between each successive stave. Compressive strength of the concrete at 28 days is 700 p.s.i. and flexural strength of the completed stave at 28 days is 1400 lb. Reinforcing is provided by ¼-in. smooth round steel bars running the full length of the two vertical sides (concave and convex edges).

Each course of staves in the silo is held in place and further reinforced by a ⅝-in. rolled steel band around the outside. The stave design is so engineered that these bands pull the staves against each other, forming a true curve, which is a basic point of the patent, according to Mr. Lawrence. The completed silo may be from 10- to 18-ft. in diameter, and any

(Continued on page 177)



Close-up of concrete staves being stored in company yard

VACUUM PROCESSED

Reinforced Concrete Pipe

By M. W. LOVING*

Shearman Concrete Pipe Co., and Thomas Concrete Pipe Co., making 89,600 ft. of reinforced concrete pipe by vacuum process for Oklahoma City, Okla., sewerage system

MORE than 89,600 ft. of reinforced concrete pipe, ranging in diameter from 24 to 66 in. and in lengths of 12 ft., are required for the new sewerage system at Oklahoma City, Okla. The system was designed and its construction is being supervised by Col. Webster L. Benham, Benham Engineering Co., Oklahoma City.

Because most of the pipe lines must be constructed below the water table, the joints are made tight to prevent infiltration of ground water and reduce pumping and sewage treatment costs to the minimum. The water table is lowered with well points, when the pipe lines are constructed, so the joints can be made and inspected in the dry trenches. The joints of the pipe are made to very close tolerances to seat and compress the Tylox rubber gaskets, uniformly, around the periphery of the joint when the pipe are drawn together with a winch.

The Nicholson Groutweld Gun, so successfully used at Tacoma, Wash., is used to weld the joints from the outside and the inner annular space is pointed with cement mortar in an excellent manner. Because "pictures speak louder than words" you can see the operations in Fig. 1 and the inner surface of a 60-in. diameter intercepter is shown in the inset, with Col. Benham holding the flash light, on November 20, 1947.

The existing sewerage system of Oklahoma City was constructed with clay segmental blocks, monolithic concrete and reinforced concrete pipe, made in 4-ft. lengths. Sand and silt have been transported in suspension by ground water through defective joints into the sewers and in many cases the sewers are more than half full of sand, silt and sludge. Because the sewers were constructed on flat grades, the velocity of the sewage was

*Consulting engineer.

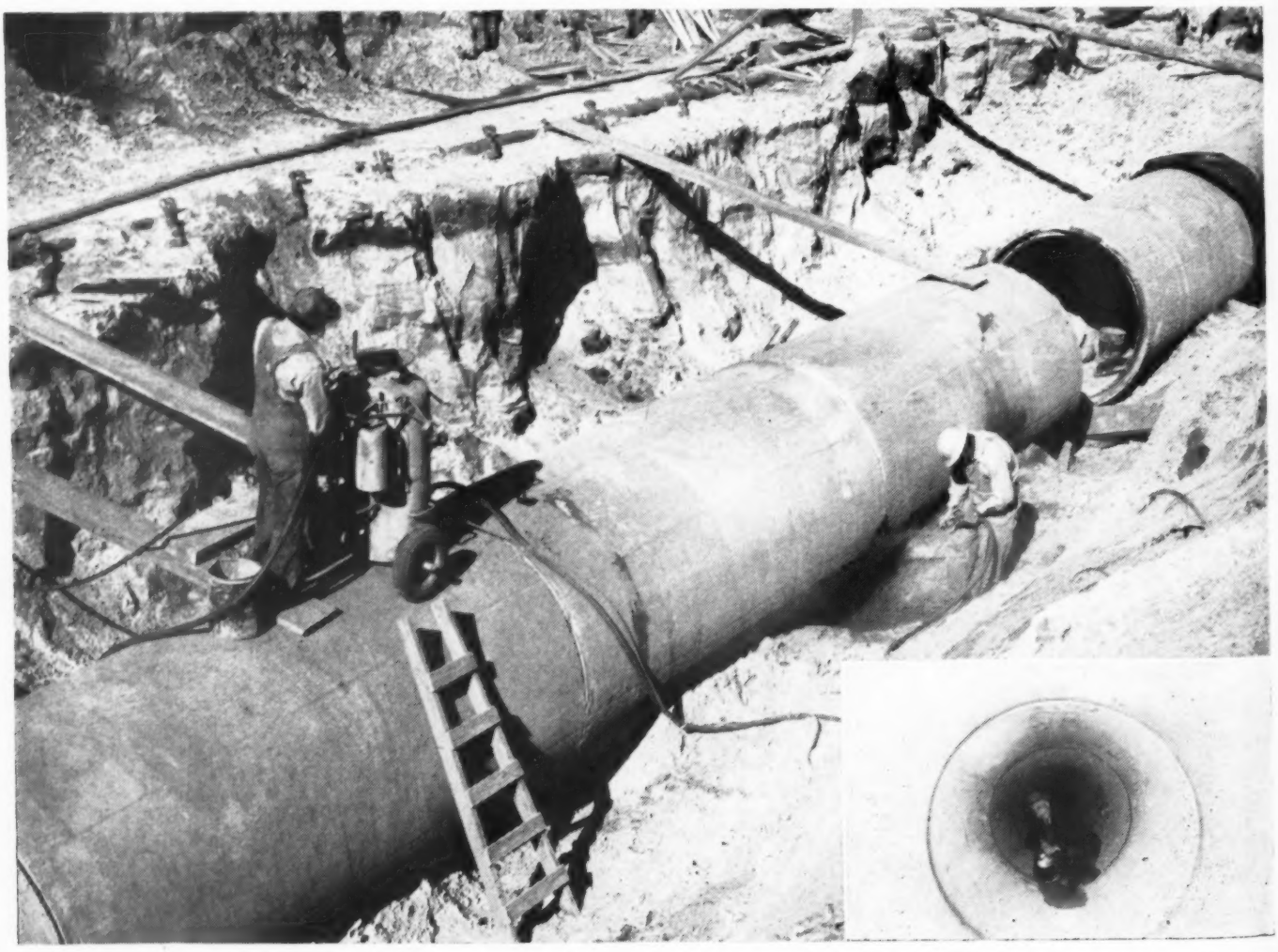
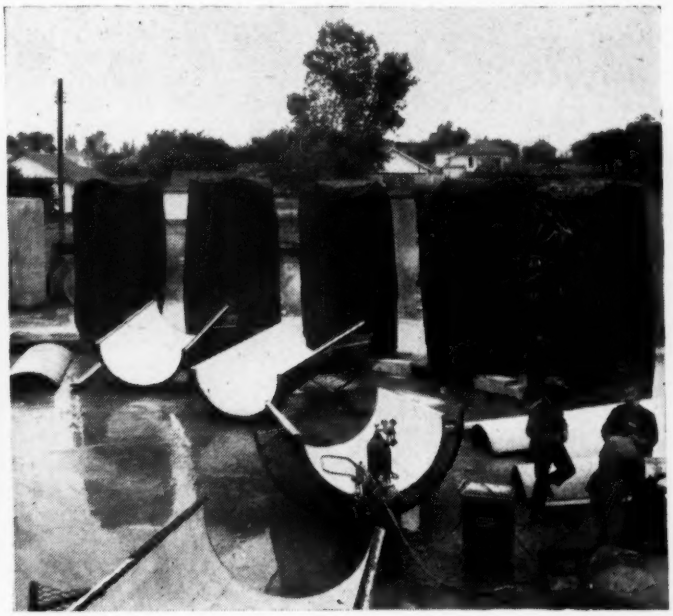


Fig. 1: View of a 60-in. diameter intercepter. These reinforced concrete pipe are 12 ft. long, and the joints are being welded with the Nicholson Groutweld gun, from the outside. Trench is de-watered by the well-point system, shown at the left
Inset shows the inner surface of the 60-in. diameter intercepter with Col. Webster L. Benham, the consulting engineer, in the background



Figs. 4 and 5: Showing the circular layout, in part, of the Thomas Concrete Pipe Co. on November 20, 1947. The 54-in. diameter pipe, 12 ft. long, are cured with steam in canvas bags or hoods. In the foreground of Fig. 5, the casings and core segments are lined and covered with canvas filter-cloth

not sufficient for self-cleansing and they have for many years, functioned as "elongated cesspools."

The new sewers are constructed on uniform grades to provide self-cleansing velocities and to make this possible, the outlet at the sewage treatment plant is constructed 8 ft. below the outlet of the existing outfall sewer, which will be abandoned. But the sewage must be pumped and this is the primary reason why the long length pipe was specified and the tight joints required. Otherwise, the new sewers like the old would not function as sewers without constant cleaning by expensive methods. These engineering details are mentioned in this article, simply to explain why the long length pipe was specified and the tight joints required. The pipe manufacturer had to take it or leave it.

Manufacturing Methods

Shearman Concrete Pipe Co., of which R. S. Lander is president and N. N. Suddreth, manager of the Oklahoma City plant, is making the pipe. To produce the pipe in 12-ft. lengths there was the choice of three methods: vibro-cast, centrifugal and the vacuum method. To produce 15 pipe by the vibro-cast method the same number of forms and top rings and at least twice that number of base rings would be required for each day's operation. Because of the high cost of forms, top and base rings in normal times and the almost prohibitive costs today, the vibro-cast method was not considered. And because of the very high investment required to produce centrifugal pipe in the several diameters, and the high unit cost of production—especially the larger diameters made in 12-ft. lengths, the centrifugal process could not be used to make the sewer pipe at the prevailing prices.

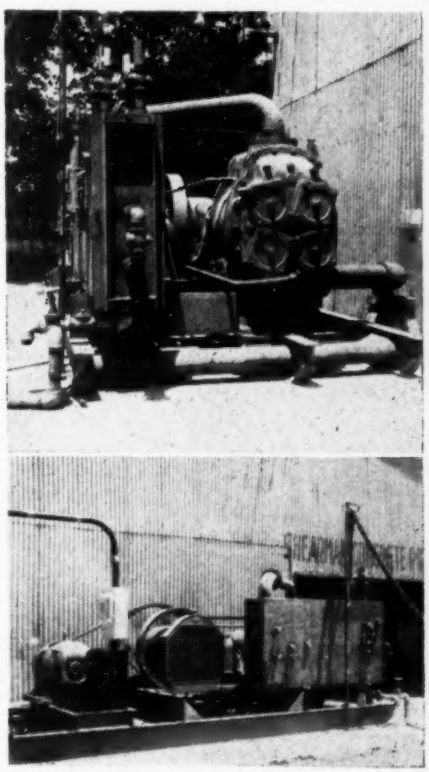
The vacuum process was chosen because it was estimated that only three forms, each fitted with one top and six base rings would be required to make 15 pipe in one 10-hr. day. As of November 20, 1947, the maximum production of 60-in. diameter pipe has been 11 and the average 8 with more than 5000 ft. made. The contractor has laid more than 4300 ft.

The vacuum unit, Figs. 2 and 3, has worked perfectly from the start because it was properly designed and made—based on many years of practical experience on very large projects: the concrete floors of large buildings including the Pentagon in Washington; structural units for large buildings; spillways for large dams, to minimize abrasion and cavitation, including Shasta Dam in Northern California and the like.

The first forms for the 54-, 60- and 66-in. pipe were made by a firm with no practical experience in the production of forms for concrete pipe. Because the gage of the metal was too light, the forms were too flimsy; besides they were not accurate and were hard to assemble. The second sets of forms were better but there was a considerable delay in getting delivery and those of us familiar with the steel and labor situation today know all about that. For example, Shearman Concrete Pipe Co. has found it almost impossible to get wedge-bolts for the forms, because the colored boys are constantly losing them; bolts and nuts have been used, and that takes time and much experience—just one of the many headaches that delays production.

The following forms are now used, after many delays that were beyond control: two 66-in. diameter forms, each with one top and six base rings; three 60-in. diameter forms, each with one top and six base rings; and three 54-in. diameter forms, each with one top and six base rings.

To expedite production, Shearman Concrete Pipe Co. has authorized the Thomas Concrete Pipe Co., Oklahoma City, to use one of its two vacuum units, and the 54-in. diameter forms, top and base rings, and this firm is now in production and had produced 29 pipe on November 20, 1947. Louis



Figs. 2 and 3: Vacuum unit soon after it was placed in service and before it was housed in. This is one of two units owned by Shearman Concrete Pipe Co. Fig. 2 shows end view

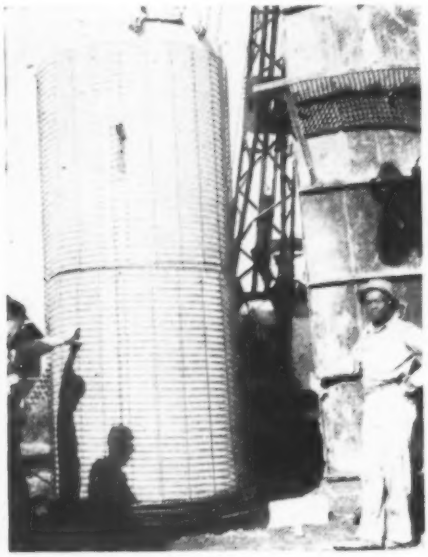


Fig. 6: Reinforcement assembly is placed over the core and its position carefully checked by the inspector, shown at the left. Galvanized wire chairs are used to hold it as a true ellipse. One of the casing segments is shown at the right; the catwalk is used by workmen at the top of each pipe for form adjustments

C. Thomas is manager and the plant layout is shown, in part, in Figs. 4 and 5.

Experience with Filter Cloth

The 60-in. forms, for example, are fitted with 15 vertical manifolds—seven on the inner form or core and eight on the outer form or casing. The casing is made in two halves and the core in three segments with a keyway. Within and under the air-tight manifolds holes, about 0.25 in. in diameter and 12 in. centers, have been drilled through the steel forms. The core is covered and the casing lined with wire screening, fastened to it.

Fig. 7: Two extra strands of wire (one required) are used in the groove of each pipe for the reasons stated in this article. Circumferential wires are lapped 40 diameters, as required. Hoses from the manifolds on the core, are shown at the lower right

Over the wire screening a filter cloth is placed; glass cloth was first used and canvas has been employed by Shearman Concrete Pipe Co. for the last several months. While the glass cloth has worked very well as a filter for vacuum mats used on large projects, this and the canvas are not considered satisfactory, by Mr. Lander and Mr. Suddreth, for lining forms to produce concrete pipe from day to day. Too much time and expense is required to line and coat the casings and cores, and in some cases the cloth filter sticks to the concrete and causes surface blemishes that must be patched and the engineers do not like that.

Rubber Multipore filter cloth has been tried experimentally, and it is predicted that it will prove to be the answer to the only bottle-neck in the scheduled production of vacuum processed reinforced concrete pipe.

The casting of the pipe requires about the same operations as vibrocast pipe, in fact vibration is a very necessary phase of the vacuum process because the concrete is densified by precision vibration. Vacuum processing removes free water and entrained air, and the end result is concrete and concrete pipe of excellent quality—very dense and impermeable. This phase is discussed later under the description of testing and the very rigid inspection at Oklahoma City.

A Farquhar belt conveyor delivers the concrete from a transit mix truck to the top steel plate on the core; the belt is about 18 in. in width and is on about a 20 deg. slope, thus there is very little separation of the coarse aggregate in the 4-in. slump concrete. The concrete is gradually placed in the form after the steel reinforcement assembly or cage is placed and secured against the core with galvanized wire chairs. Each cage is checked by an inspector before the casing is set in position; the details can be seen in Figs. 6 and 7. The cage is placed exactly as an ellipse, and it remains that way because pipe are sawed in 4-ft. lengths for 3-edge testing; this is mentioned later.

The forms are filled with concrete which is carefully vibrated with one Viber unit, for internal vibration, attached to the casing about half way up. Vacuum is then applied for 18 to 30 minutes depending on weather conditions. Free water and entrained air is removed from the concrete by atmospheric pressure and escapes through the filter to the vertical manifolds, at the bottom outlets, to the vacuum pump. This can be seen, in Fig. 8, better than it can be explained. About 4 gal. of water per sack of cement remains in the concrete to assure proper hydration of the high-early-strength cement.

When the concrete at the top, around the tongue, is hard, the top

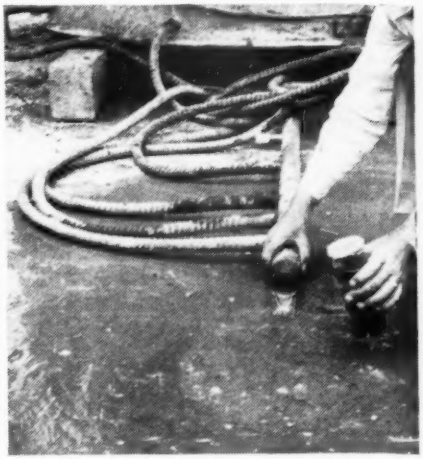


Fig. 8: Hose lines leading from the vertical manifolds on the casings are clearly shown in this picture. Water running out of the metal pipe, leading to the vacuum pump, was removed from the concrete by vibration (before vacuum processing) and is crystal clear

ring, core and casing are removed with a crane. (But this can and will be done in future operations with a hoist on a gantry or similar crane, in a plant especially designed for producing long length pipe.)

Thomas Concrete Pipe Co. is using a circular layout, which can be seen in part in Figs. 4 and 5, for the production of 15 pipe per day. A crane in the center handles the forms, steel cages, concrete, and is used to strip the cores, casings, and top rings. Another crane handles the pipe from the "production circle" and yards them. Twenty-nine 54-in. diameter pipe had been made to November 20, 1947, when the author was in Oklahoma City.

Both pipe companies are using canvas bags for steam curing the pipe,

Fig. 9: Section of 60-in. vacuum processed reinforced concrete pipe sawed up for the 3-edge test. One circumferential wire was sawed through without breaking its bond to the concrete at any point. Note the exact placement of the elliptical reinforcement

even in the hot, dry weather. This may be more expensive than curing boxes, used in the manufacture of reinforced concrete pressure pipe, in lengths up to 16 ft. or more.

Inspection and Testing

Pipe are required to meet the design and test provisions of the Standard Specifications for Reinforced Concrete Culvert Pipe, A. S. T. M. Designation: C 76-41. The Benham Engineering Co., previously referred to as in charge of pipe line construction and inspection of the pipe, is very thorough but fair and reasonable. The City Manager and the City Engineer, the latter functioning as coordinating engineer for the sewerage project, have retained a local testing laboratory to test everything: fine and coarse aggregate, cement, steel and all phases of pipe manufacture. Shearman Concrete Pipe Co. has retained another testing laboratory to keep accurate records of materials and pipe testing, and the ready-mixed concrete company also has a testing laboratory to check its materials and concrete. Thus, the city is getting what it is paying for.

After about 800 ft. of pipe had been made by Shearman Concrete Pipe Co. in June, 1947, the question of testing the pipe became an issue. Because this company is one of my clients I was asked to fly to Oklahoma City. It was then and still is my opinion that the 12 ft. length pipe should be tested by the cylinder control method as required in Section 28 of the specification above named. In a conference with the top officials of the American Society for Testing Materials, in Philadelphia, the same month, they felt that the elected officers of Committee C-13 on Concrete Pipe should rule in the matter since there was some conflict in the wording of the CULVERT pipe specification that was being used for sewer pipe at Oklahoma City. Until 1946, I was secretary of Committee C-13 from the time it was organized in 1930, and it was my duty to interpret obscure provisions of concrete pipe specifications for the A.S.T.M.

However, the engineers at Oklahoma City decided to test the 60-in. pipe by the 3-edge method. The only testing machine for testing 12-ft. length pipe was in Chicago, and cost more than $25,000 about 15 years ago. If the pipe could be shipped to Chicago for the test the question was who would pay for the test; besides a machine of that kind would cost many times what it did years ago. Moreover it is impossible to apply the load uniformly from end to end, thus a large percentage of the total load would be concentrated at one or more points. Shearman Concrete Pipe Co. elected to cut up a pipe so the 3-edge test could be made on a section about 4 ft. in length. Sawing the pipe was

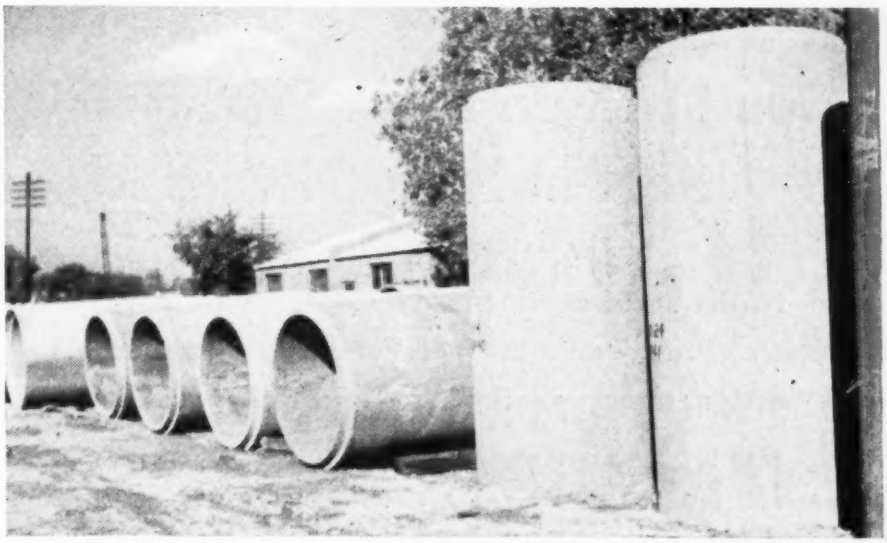


Fig. 10: Shearman Concrete Pipe Co. delivers the pipe to the trench. This view shows some of the 60-in. diameter, 12-ft. length pipe ready for installation

tried, but with the equipment then available that could not be done, but it was accomplished with chip-hammers.

After this section was tested in July, I was asked by Mr. Suddreth to fly to Oklahoma City. With a shell thickness of only 5 in. the section withstood a loading of 7250 lb. per ft. at .01-in. crack and 13,650 lb. per ft. at ultimate load. The A.S.T.M. specifications required 6000 and 10,000 lb. per ft. for the .01-in. crack and ultimate loads for standard culvert pipe. But the pipe was rejected because tests of the sand used by the ready mixed concrete company indicated it was too fine, according to one testing laboratory but acceptable under A.S. T.M. Specifications for fine and coarse aggregates by another testing laboratory. Because the steel cage was placed as an ellipse it was necessary to cut two circumferential wires so the cage could be fitted onto the base ring. Under Section 15 of the specifications: ". . . the joint shall have a circumferential reinforcement equal in area to that of a single line within the barrel of the pipe." When the 12-ft. long pipe was cut up for testing, it was found that this provision was not complied with and all the pipe were rejected for this reason and regardless of the fact that the 3-edge test had exceeded the required load by 50 per cent. Also in this test section, the steel reinforcement was near the center of the pipe shell on one side, because the cage was formed as a circle and placed in the form as an ellipse but not braced with spacers against the form for fear of tearing the filter cloth. When vibrated, the cage, unless braced against the form, may again become a circle at the upper end of the pipe; the cage is secured as an ellipse on the base ring. After this experience the cages were braced against the core with wire chairs, and no further trouble has been experi-

(Continued on page 172)

Figs. 11 and 12: These pictures were taken of a demonstration by Vacuum Concrete, Inc., Philadelphia, Penn., in November, 1946. A rubber bag, partly filled with loose sand is shown in Fig. 11, above. When vacuumed, this same bag of loose sand becomes as hard as a rock, instantly, as shown in Fig. 12, below

Southeastern Block Producers Meet in New Orleans

National Concrete Masonry Association covers curing methods, merchandising, modular design, labor relations at regional meeting

Henry E. Buchholz, president of N.C.M.A., with Tom Goodbee

OPTIMISM for the future keynoted the recent meeting of the Southeastern Group, National Concrete Masonry Association, held November 8 through 11, at New Orleans, La. An annual production of ten billion units was predicted as highly possible for the United States block industry in a talk by John L. Strandberg, Concrete Building Units Co., Kansas City, Mo., past president, N.C.M.A. Having just returned from an extensive tour of Scandinavian countries, his prediction was based on what he found in that part of the world. Mr. Strandberg spoke of the total use to which concrete block are being put in Norway, Sweden and Denmark — from hotels and industrial buildings to barns and chicken houses. He stressed the complete mechanization of Scandinavian block plants, where one push-button plant visited had an annual production of 25,000,000 units.

The meeting was divided into two parts, with national association officers and directors meeting Saturday and Sunday at the Roosevelt hotel, and the Southeastern Group convention being held for two days starting Monday. The Southeastern group meeeting was under the direction of GEO. W. KATTERJOHN, Geo. W. Katterjohn Concrete Products, Paducah, Ky., vice-president, N.C.M.A. Alatex Concrete Products, Inc., LEWIS LLOYD, vice-president and manager; and Crescent Concrete Products, TOM GOODBEE, president, both of New Orleans, were official hosts for the convention. New Orleans was chosen as the convention city, for at this time of year, with snow falling elsewhere, the Crescent City offered an opportunity for recreation unequaled in the north. Total registration was 203, including 54 ladies, drawn from 23 states and representing 66 concrete masonry plants.

Convention Business Sessions

First session of the general convention, Monday morning, was given over to an exchange of ideas among producers from all sections of the South. With the forum led by Lloyd Lewis, producers were called upon to speak extemporaneously concerning conditions in their particular operating area. Number one problem facing the majority of block producers, as brought out in this forum, is the cement shortage; with shortages of lightweight aggregate taking a close second place. Car shortages were mentioned as a contributing factor.

Lesser problems, in that they were spotted through the industry rather than universal, were labor trouble (both in and outside the plant) and purely local price cutting by small operators. Still fewer producers were faced with skilled-labor shortages in particular areas; and despite grievances, producers for the most part were optimistic over the future.

Following the open forum, PERCE CLEMENT, Geo. W. Katterjohn Concrete Products, presented a paper on the need for good merchandising of concrete products. Mr. Clement's talk covered the sound reasons for clean housekeeping in a concrete masonry plant; types of advertising best adapted to the use of such a manufacturer; the coming need for well trained, courteous salesmen; and lastly, the demonstrable dollars and cents value of efficient and complete customer service. Also covered in this discussion were the twin subjects of selling-price and quality block; and the relationship between cash and credit sales.

WARREN SMITH, sales manager, Lone Star Cement Co., New Orleans, next gave an interesting analysis of sales problems, accompanying his address with sleight-of-hand tricks to emphasize points brought out. Mr. Smith stressed the need for unified action among block manufacturers as typified in association support; and also the necessity for close contact between local brick masons and block plants.

JERRY WATT, technical service director, Lehigh Portland Cement Co., Allentown, Penn., was scheduled for

Yacht "Good Neighbor" chartered by the N.C.M.A. with the New Orleans skyline as a background

the Monday morning session, but was unable to be present because of the necessity of attending the Portland Cement Association meeting held in Chicago on the same day. Mr. Watt's place on the program was taken by John Strandberg, mentioned earlier, who spoke extemporaneously about his tour to Scandinavian countries. He spoke interestingly of his flight from New York, touching at Iceland, which is becoming a cross-roads airport for all world airlines (and using block for building). Concrete block is being produced and used at points farther north than the Arctic Circle.

Convention Luncheon

TOM GOODBEE was master of ceremonies for the convention lunch held in the Roosevelt hotel Blue Room, and as the first order of business introduced HENRY BUCHHOLZ, Illinois Brick Co., president of N.C.M.A. Mr. Buchholz told the group that the officers and directors of the association meet in various parts of the country ". . . so

Geo. W. Katterjohn, left, and E. W. Dienhart, at the luncheon on Monday

that all sections can see how we operate." He went on to say that the association was willing and anxious to help solve problems of all members whenever a particular problem had national significance. He then introduced each of the nine directors present, who represented states as widely separated as Connecticut and Utah. Six past presidents were also introduced.

Following the lunch, Monday afternoon's business session was led off by E. W. DIENHART, executive secretary, N.C.M.A., with a discussion of the activities of the association. Mr. Dienhart traced the background history of the association and its activities during the war years, bringing the talk down to the present time by emphasizing the importance of the concrete block industry in this country's economy. He also spoke of the association's work in the fields of research through such organizations as the American Society for Testing Materials and others; and work carried on by the association in Washington on behalf of its members as regards legislation and court cases.

Mr. Dienhart also mentioned the various association publications such as the N.C.M.A. pictorial and modular house plans. He was particularly pleased to report ready acceptance by the general public of modular house plans as published by the association.

On the Yacht, Good Neighbor. Left to right: Paul Woodworth, G. O. Greene, E. W. Dienhart, H. A. Oberling, and Geo. Katterjohn

ALLAN WALLSWORTH, Milwaukee, Wis., architect, presented a paper to the Monday afternoon session concerning the concrete masonry industry and its relation to modular design in building. Mr. Wallsworth has been retained by the Besser Manufacturing Co. not only to make a study of modular design in concrete block construction, but also as architect for a group of houses to be built in Alpena, Mich., using modular block. He spoke of Alfred P. Bemis as the father of the idea of modular design in building; and went on to say that the slow progress made by this idea has been due in a large part to the inertia of the building public: "We are suspicious of change and tend toward stubborn immovability regarding a new concept."

JOHN SHAVER, editor, *Concrete*, gave a short talk on the N.C.M.A. Pictorial, and described it as a piece of promotional literature that provides a third dimension for the sales effort of block producers. The last speaker of the afternoon was HUGH ROBERTS, regional representative, Portland Cement Association. The scheduled speaker, H. J. McDargh, manager, southeastern offices, P.C.A., was unable to appear. Mr. Roberts presented a new sound-motion picture entitled "Building a Concrete Unit Home," a recent P.C.A. release.

Causes of Leaks and Cracks

Condensation was the subject for the first talk when the group re-convened on Tuesday morning. BEN G. WALLIS, assistant sales director, Florida Portland Cement Co., Tampa (division, General Portland Cement Co., Chicago), spoke briefly about harm done to the concrete block industry by opportunists who rush any block to market in order to meet the demand. His main thesis was concerned with properly cured blocks as the best insurance against cracks and leaks.

Left to right: Henry Buchholz, Mrs. Wm. Oliver, Baton Rouge; and W. F. Smith and H. A. Sawyer of Lone Star

A dinner group at Arnaud's. In the foreground may be seen Lewis Lloyd of Alatex Concrete Products and R. F. Leftwich. Roy Darden and Henry Buchholz are at the table at the left

Pouring ice-water from a vacuum bottle to a glass gave what he called visual aid in selling. Shortly the glass was wet on the outside, and yet it did not leak; and at the same time, because of the perfect insulation afforded by the vacuum bottle, no condensation had taken place on its exterior surface. Mr. Wallis used this demonstration to show that most so-called leaks are really only cases of condensation.

PHIL PAOLELLA, Plasticrete Corp., Hamden, Conn., N.C.M.A. director, gave a short address on the meaning of Armistice Day; and at 11 o'clock led the group in a prayer for the departed and for peace in the future.

The balance of the morning's session was given over to discussion of technical problems, with the main address given by R. E. COPELAND, technical director, N.C.M.A. In his opening remarks Mr. Copeland said that "the responsibility of the concrete masonry industry to the public increases as the stature of the industry in the building field grows." The subject of curing was discussed by Paul Woodworth, secretary of the National Concrete Masonry Association Curing Committee. The importance of this subject was brought home with the statement that 54 per cent, or over half of all blocks produced in 1946, were made in only 9 per cent of the total plants.

Recommended Curing Cycle

Mr. Woodworth described the extensive tests that the association has been carrying on at three concrete products plants. Each plant was chosen because it allowed study of a different type of aggregate: sand and gravel, cinder, and celocrete. Aim of the committee was to find if a 24-hr. curing cycle could be made to yield a block that would meet compressive strength, absorption and water content value tests. As a result of these extensive tests, the N.C.M.A. recommends the following curing cycle:

1. Maximum temperature 165 - 175 deg. F.
2. 2-hrs. holding time after kiln is filled.
3. Not less than 3-hr. live steam time, with 1-hr. at ceiling temperature.
4. Heat increase not to exceed 60 deg. per hr.
5. 8-hr. soaking time (live steam turned off).
6. 3-hr. dry air circulation.

Mr. Copeland followed Mr. Woodworth and made the statement that the new recommended cycle should save the industry as high as $250,000 over the cycle printed in the first progress report of the curing committee. Taken into account in the figure was also the saving of first or replacement installation of steam plants of lower capacity. As something for the group to think about, he pointed up the question: "Are we (the concrete masonry industry) reaching the point of diminishing returns from the standpoint of mechanization?"

PHIL PAOLELLA led a discussion of the advantages to be derived from cubing and use of fork-trucks in block plants. It was brought out that with paved storage space, truck-height loading ramps and proper planning, cubing could be made to pay dividends. Other items mentioned briefly by Mr. Copeland were continuous mixers, chromium plating for mold-boxes and cores; cavity construction and block for radiant heating floor construction. Lightweight aggregate was also spoken of, and various types of sintering and sintering machines.

CLOYD B. FELLABAUM, National Cement Products Co., Toledo, Ohio, spoke about his work as secretary of the Association's Accident Prevention Committee.

The afternoon was given over to a

In this group may be seen B. F. Hulsey, Chattanooga; Mrs. A. Wallsworth, D. R. Fox, Mr. and Mrs. Haakon Paulson

Left to right: Deane R. Lynde, chairman of the board, N.C.M.A.; Roy N. McCandless, and Otto Buehner from Salt Lake City

group tour of both a concrete products plant and a cement mill. First stop on the tour was the plant of Crescent Concrete Products Corp., where production of a 30 per cent hard slag, 70 per cent Superock block by a Besser Super Vibrapac was demonstrated. Also inspected were the low-temperature kilns and the yard, where cubing is used extensively. The Lone Star Cement mill located on the ship canal just outside New Orleans was visited next. Here the group was divided into parties of about ten each and taken on a conducted tour of the mill from the unloading of limestone from river barges, the grinding department and slurry mixing basins to the rotary kilns, and finally through the packing house.

As this was the last official business of the convention, the group disbanded upon return to the hotel.

Social Activities

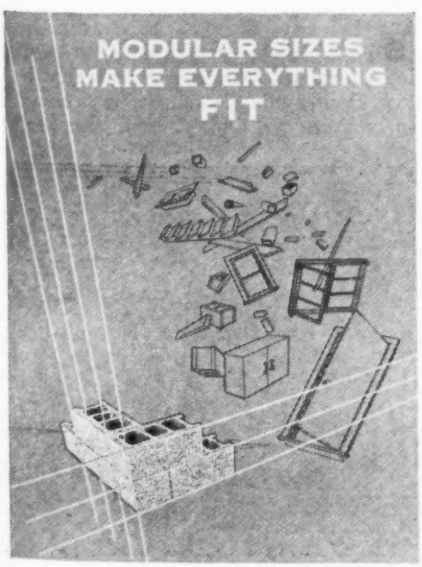
Non-scheduled social activities for some of the early arrivals began Friday night at Arnaud's inner bar; then, via shrimp a la Arnaud and other shell fish delicacies and an unconducted tour of New Orleans' French Quarter, they became old hands to instruct newcomers on Saturday and Sunday. Although the week-end was scheduled as a closed meeting for officers and directors of the national association, more than half of those attending the regular southeastern group convention arrived one to three days early so as to be able to enjoy the sunny South a few extra days.

Sitting outdoors at Pat O'Brien's Patio Bar late Saturday night, the participants were able to laugh when told by conventioneers from afar of snow falling in Denver and Connecticut, Salt Lake City and Chicago. Apparently almost everybody attending the convention passed through the

(Continued on page 182)

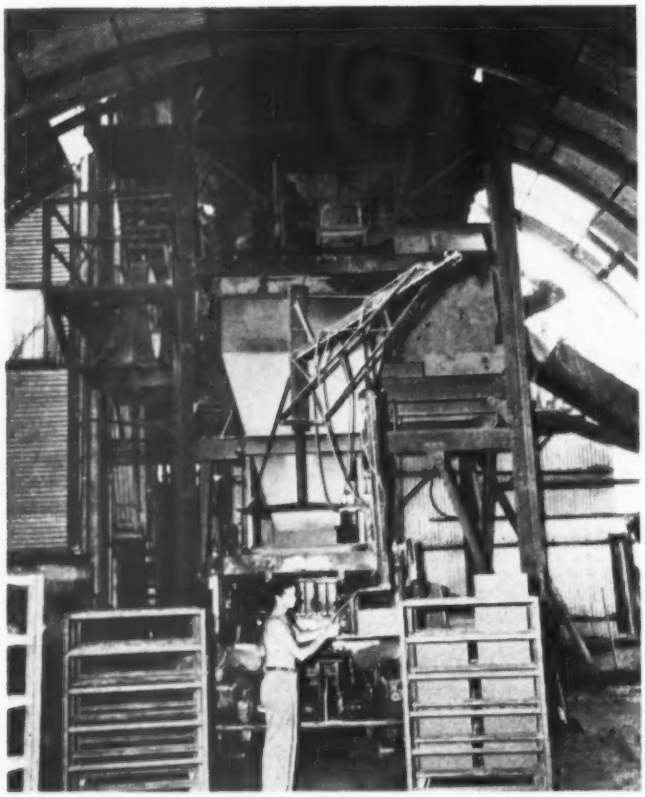
On a walking tour of New Orleans, starting at Brousard's restaurant. A very good delegation of ladies accompanied their husbands on this trip

At Arnaud's on Saturday night. Hardy Magrath of Lehigh, to the left. This is one of the spots that attracted the delegates to the convention



Wall chart used by Architect Wallsworth in his talk on modular sizes

Carroll Strohm, Jr., Nashville Breeko Block & Tile Co., Mr. and Mrs. Geo. Katterjohn, and Lloyd Lewis, to the right



Production "tower" in which is housed four aggregate bins, each of 30-cu. yd. capacity; two cement bins, each of 45-bbl. capacity; a complete batching unit; a 2-cu. yd. mixer, and block machine

LIMESTONE FINES for Block and Ready Mix

Clinton Construction Co., Wilmington, Ohio, builds plant for future expansion with space for additional block machines. Uses limestone, as coarse aggregate, and also limestone sand, in all of its concrete mixes

By DAVID MOCINE

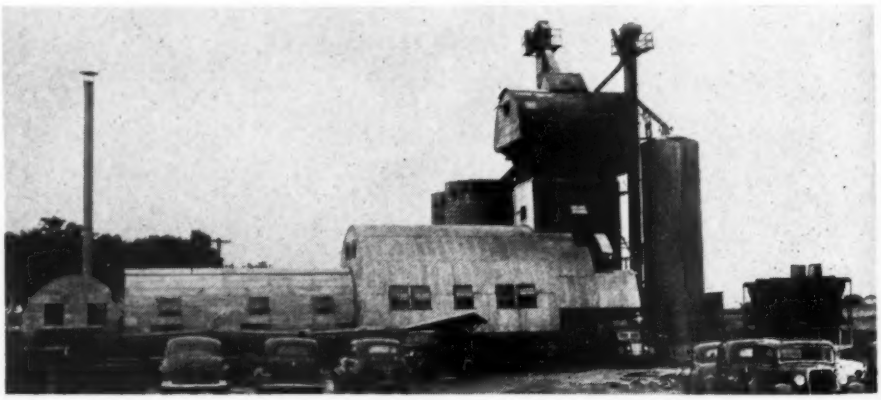
WITH three large corrugated galvanized steel buildings of quonset-type design, the new plant of Clinton Construction Co., Wilmington, Ohio, has been built with an eye to possible future expansion. The plant includes a two-track railroad siding for bulk cement and aggregate deliveries; space for additional block machines and more than six acres of available land. At the west end of the largest building, measuring 40- x 40-ft. and 50-ft. high, is located all the weigh-batching and mixing equipment for both the block and ready mixed concrete operations, with the remainder of the first building being given over to block manufacture. Adjacent to this plant structure is a similar 20- x 40-ft. building housing six kilns, and at right angles to the first building is another measuring 20- x 30-ft. containing the boiler and maintenance equipment.

P. F. Beam is superintendent of both block and ready mixed concrete operations at Clinton Construction Co., and is well known in the rock products field. The plant uses limestone, as coarse aggregate and manufactured limestone sand, in all its mixes for ready mixed concrete and also for block manufacture. Density obtained with this 100 per cent limestone aggregate is reported as exceptionally good, and after 15 hr. in the kilns and six days in yard storage a strength of 1400 to 1600 p.s.i. is obtained.

Several mix proportions have been tried, with a 50 per cent sand and 50 per cent crushed stone mix yielding a strong, dense block; but a mix of 60 per cent sand and 40 per cent stone makes a more desirable mix from the standpoint of workability, and still yields a block of more than sufficient strength to pass A.S.T.M. specifications.

Bulk air-entraining portland cement, delivered by rail, is spotted on a two-car siding from which it is transferred to the plant by a 10-in. screw conveyor, 28 ft. long, powered by a 7½-hp. electric motor. The screw conveyor delivers cement to a bucket elevator, 50 ft. centers, at the top of which is a flop gate that diverts cement to either overhead bin for weigh-batcher feed or silo storage. Limestone aggregate, delivered in hopper-bottomed cars spotted on a seven-car siding, is reclaimed from a hopper under the tracks by an 18-in. conveyor belt, 25 ft. centers, with 80 t.p.h. capacity. Aggregate is discharged from the belt to a bucket elevator, 50 ft. centers, and by means of a flop gate may be directed to any one of four silos. These silos are of reinforced concrete slab construction, measuring 16-ft. in diameter by 40-ft. in height, and having a capacity of 135-cu. yd. each.

Aggregate is drawn from the bottom of the silos by gravity feed and chuted to an 18-in. conveyor belt, 40 ft. centers, located between the four silos, two on each side. It is moved to overhead bins by bucket elevator, 70 ft. centers, with a capacity of 80 t.p.h., powered by a 10-hp. electric motor. Cement and aggregates for the mixes are accurately proportioned by a weigh-batcher. The batcher dumps its contents to a hopper and pants leg chute to two mixers directly below. Ready mixed concrete is produced in a 2-cu. yd. mixer and the block



Concrete block plant in buildings to the left, batching plant for ready mixed concrete and cement silo to the right, with aggregate silos to the rear

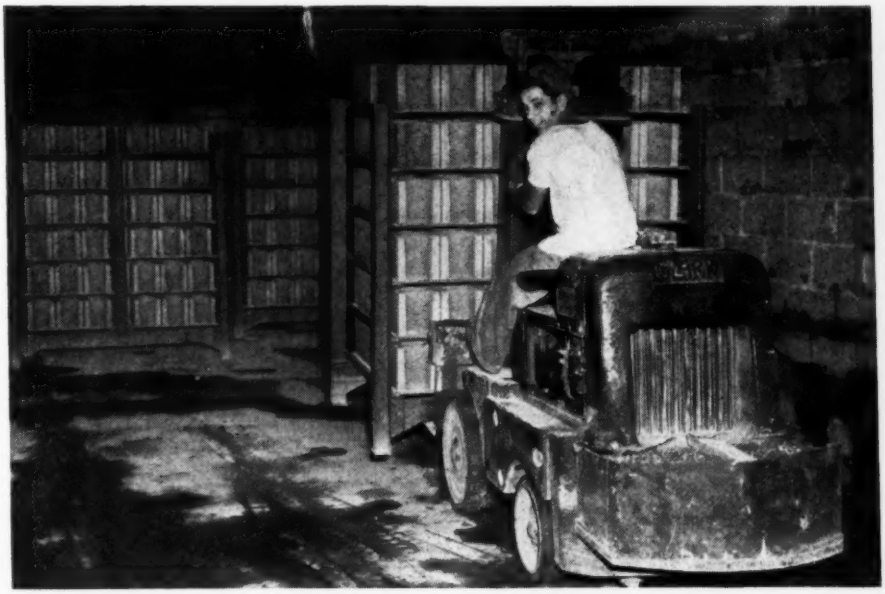
machine is charged by a 50-cu. ft. mixer. Mixing water is drawn from an auxiliary tank with valve within convenient reach of the mixer operator.

A Besser Vibrapac block machine, with a capacity of 600 modular 8- x 8- x 16-in. block per hour, is able to turn out a full line of block, using plain pallets that weigh 40-lb. each. A pneumatic off-bearer is used to transfer the block to 72-unit racks which are moved by lift truck to kilns holding 20 racks. The six kilns are of concrete block construction with precast concrete roof slabs. Curing cycle provides for 8 hr. of live steam followed by an 8-hr. soaking period. Kilns are then opened and block taken to the yard by lift truck for cubing. Steam at 10-lb. boiler pressure is piped to the kilns and introduced in the rooms through perforated pipe. A temperature of 140 deg. F. is maintained in the kilns.

Water is supplied from a spring fed artificial lake constructed on company property and pumped by a 2-in. centrifugal pump powered by a 7½-hp. squirrel cage motor equipped with an automatic stopping and starting device. It is piped to a 550-gal. tank 40-ft. above ground level. Air pressure at 100 to 130 lb. is developed by a 6- x 6-in. two-stage air compressor, powered by a 10-hp. motor. Compressed air is used for the block machine off-bearer and to fluff cement in transferring from silo to bin or bin to mixer. Air, diaphragm-regulated to 10-lb. pressure, is introduced into the weigh batchers for the same purpose. An oil-fired low pressure boiler, with safety device, automatic water feed and time clock control allows the plant to close for the day when live steam is still entering the kilns.

A 10,000-lb. pull car mover, driven by a 10-hp. motor, is used for spotting aggregate and cement cars, and when some problems in the new plant are worked out it is planned to start the manufacture of additional concrete product lines such as brick, lintels, etc.

Aggregate and cement conveying equipment and weigh-batchers were supplied by C. S. Johnson Co. Two Master Electric 10-hp. motors were used for bucket elevator power. For ready mixed concrete an S-56 Koehring mixer charges a 2-cu. yd. Dumpcrete, and two 3-cu. yd. and two 4½-cu. yd. Rex Motomix haulage units. Deliveries are made in a 30-mile radius. The mixer supplying the block machine, the block machine and the off-bearer are all of Besser manufacture. Air is supplied by a Worthington 2-stage air compressor; water by a Weinman 2-in. pump, and steam by a Minneapolis-Honeywell controlled Brownell low-pressure boiler. Three gasoline powered lift trucks, two Clarks and one Ross are used to move blocks in the plant and yard.



Curing room has concrete block walls and Flexicore roof slabs

One of two lift trucks which move block from machine to curing rooms and from curing rooms

Three-wheel, pneumatic-tired lift truck for storing cubed block in yard or for loading trucks

Vacuum Concrete Pipe

(Continued from page 165)

enced with misplaced steel reinforcement.

Attention is called to Fig. 9 which is a view of a section sawed from a 60-in. pipe; the saw actually cut through one of the circumferential wires without breaking its bond to the concrete at any point. This picture was made by the writer on November 20 at Mr. Lander's request and in his presence. We both agreed that this vacuum processed concrete is of outstanding quality—very dense and impermeable, and this is evident from this picture. He said that a section sawed from a 60-in. pipe, only 7 days old, was tested by the 3-edge method and passed the 0.01 in. and ultimate load requirements. Remember the shell thickness of this pipe is only 5 in.—the conventional thickness of the shell of 60-in. culvert pipe is 6 in. Another section was sawed from a 60-in. pipe about 28 days old, and when tested by the 3-edge method it exceeded the .01 crack and ultimate load requirements by 50 per cent. So far as the quality of the concrete is concerned, there is no question from any quarter as to its excellence.

Two 5 in. cubes, sawed from the pipe were tested for compressive strength and the results were 6000 and 6630 p.s.i. Several sawed sections from the pipe shell have been tested for absorption, and the results have ranged from 5 to 6 per cent. The A.S.T.M. requirements are 4500 p.s.i. for the concrete and 8 per cent maximum absorption by the 5-hr. boiling method.

So far as I know, no tests for internal hydrostatic pressure have been made with reinforced concrete pipe, in commercial production, manufactured by the vacuum process. This test is not required in the culvert specifications, but the Shearman Concrete Pipe Co. has been awarded a contract for about 16,000 ft. of reinforced concrete pressure pipe for water supply at Sapulpa, Okla. The 18-in. diameter pipe will be made in 12 ft. lengths at its Tulsa, Okla., plant, with plant and handling equipment specially designed to make pipe in long lengths. Hydrostatic tests will there be made on full sized pipe and pressure joints to provide for expansion and contraction, without leakage.

The demand is so great today for reinforced concrete pressure pipe that this will be a very profitable venture for years to come, as has been proven by the one or two companies that have engaged in this business for the last 30 or more years in the United States. But this class of pipe must be very carefully made with dense and impermeable concrete, and provided with joints so designed that expansion and contraction can take place, without leakage at the joints, due to the wide variation in the temperature of the water conveyed—winter and summer.

Moreover, prestressed reinforced concrete pipe will, in my judgment, be the water pipe of the future, and the vacuum process will be extensively used for the manufacture of this class of pipe, as well as the conventional kinds, that have been so successfully used to this day.

Speaking of prestressed reinforced concrete pipe, few engineers and manufacturers realize the tremendous advantages of prestressing with oil tempered spring steel wire—from the external loading standpoint. One 48-in. diameter reinforced concrete sewer pipe, 5 ft. long and with a shell thickness of 5 in., was wound with 6-gage wire on a pitch of one inch at about 100,000 p.s.i. It was then provided with a cover-coat of cement mortar one inch in thickness. When tested by the 3-edge method, to the limit of the hydraulic jack, the first visible crack developed at the crown and invert at 37,000 lb. per ft. Just as soon as the load was released the fine crack closed so tight it has never been seen since. So in the years ahead the progressive manufacturer of concrete pipe can make pipe to meet any required strength to meet special loading conditions.

Mobile Batcher

WILLARD CONCRETE & MANUFACTURING Co., Lynwood, Calif., has designed a mobile self-loading weigh batcher for concrete. This unit picks up the aggregate from a stockpile with an endless chain bucket elevator, weighing the batch on a 3-beam, boxed in standard scale which individually weighs the sand, rock or gravel and cement. The weigh-batcher has a 2½-cu. yd. capacity, weighs 5880 lbs., is driven by a 4-cylinder, 40-hp. Ford tractor motor, and is mounted on truck wheels.

For loading the mixer, a unique conveyor is employed, also mobile and wheel mounted. This unit slides under the weigh-batcher at the low end, receiving the load on a 20-in. conveyor belt which in turn unloads into the mixer drum, at the high end. The 2½-cu. yd. mixer fits on any 1½-ton, short wheel base truck, and dispenses with an engine by operating off the truck power take-off by means of a steel roller chain.

Efficient Method of Handling Pipe

LLOYD M. PARKER, youthful president of the Mid-South Concrete Pipe Co., Memphis, Tenn., designed and constructed a very useful and efficient piece of equipment to handle the heavy pipe and forms employed in the manufacture of large diameter reinforced concrete pipe, made by the machine-tamped process. Five action pictures, shown as Figs. 1 to 5, were taken of this equipment.

Fig. 1 is a view of the arms used on the Towmotor for lateral adjustment and in Fig. 2 the two colored gentlemen are setting the jacket over the reinforcement assembly. The form assembly is then taken to the machine room where the semi-dry concrete is compacted in the form; the inner form or core is an integral part of the machine, which remains stationary and trowels the inner surface of the pipe, as the concrete is placed and tamped. Fig. 3 shows how the form is stripped laterally; then it is lifted, vertically as shown in Figs. 4 and 7. In April, 1947, I visited Mr. Parker's modern plant and took pictures of the storage yard, shown in part in Fig. 5 and Mr. Parker may be seen at the left in Fig. 6. (See page 173.)

Oldtimers in the industry will be interested to know that Lloyd was a protégé of the late A. N. Shearman of Knoxville, Tenn., who was a firm believer in hand-labor. He would spend no money for equipment, and not until 1922 would he use pipe making machinery; the very lightest forms were used and cement, sand and crushed stone was handled with battered water buckets. Labor was then about 15¢ per hour. A little tub mixer was used to mix the sloppy concrete or "mud." When I used to kid him about his manufacturing methods he would say: "Son, when I want to move my plant, I'm like the Tennessee mountaineer, all I've got to do is throw water on the fire and call the dog."

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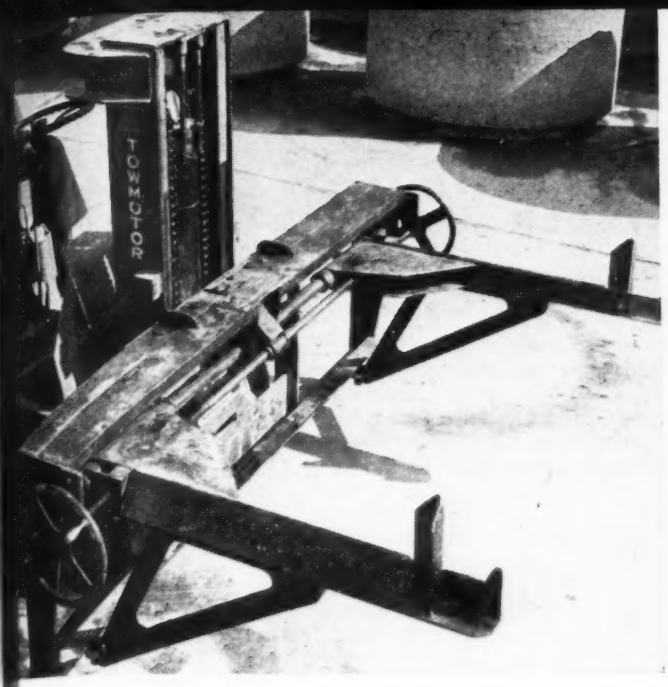
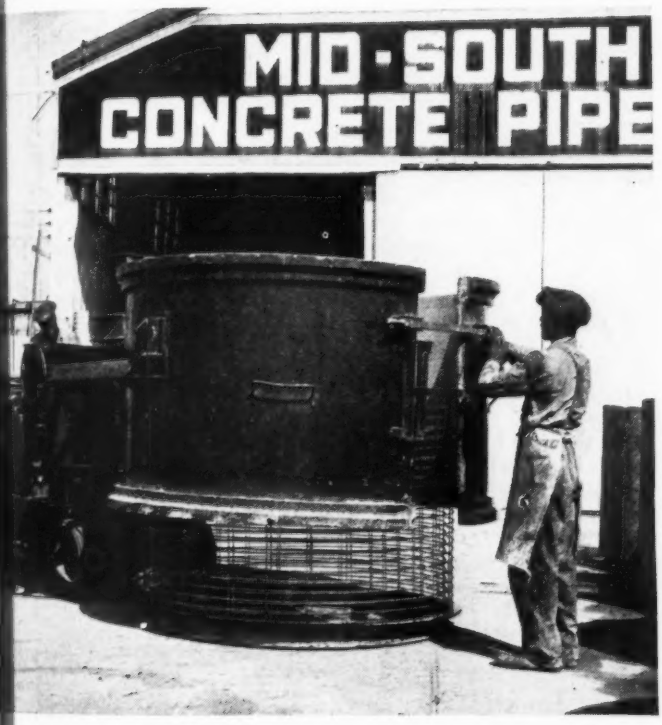
CHARLES FRANCIS MASSEY, founder of the Massey Concrete Products Co., Chicago, Ill., died recently at his home in Miami Beach, Fla.

Portable weigh-batcher and mixer combination



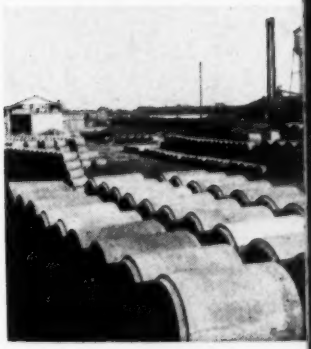


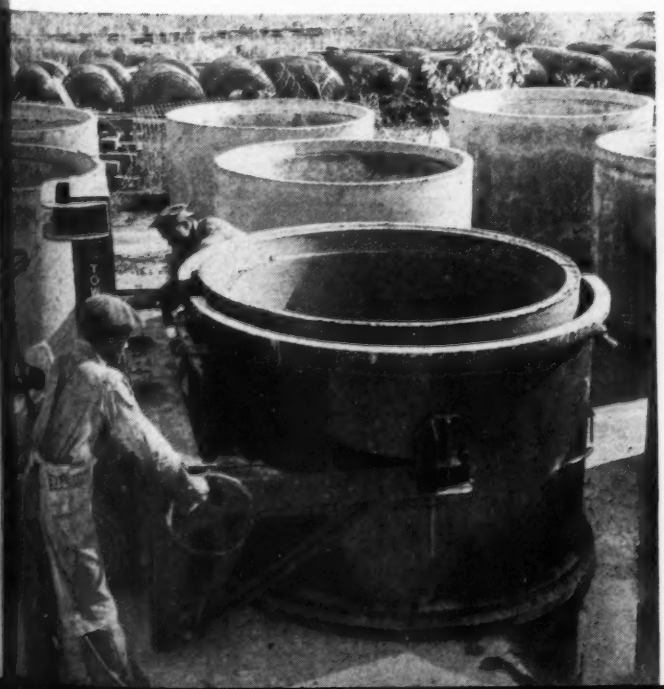
Mechanizing Handling of Pipe Forms

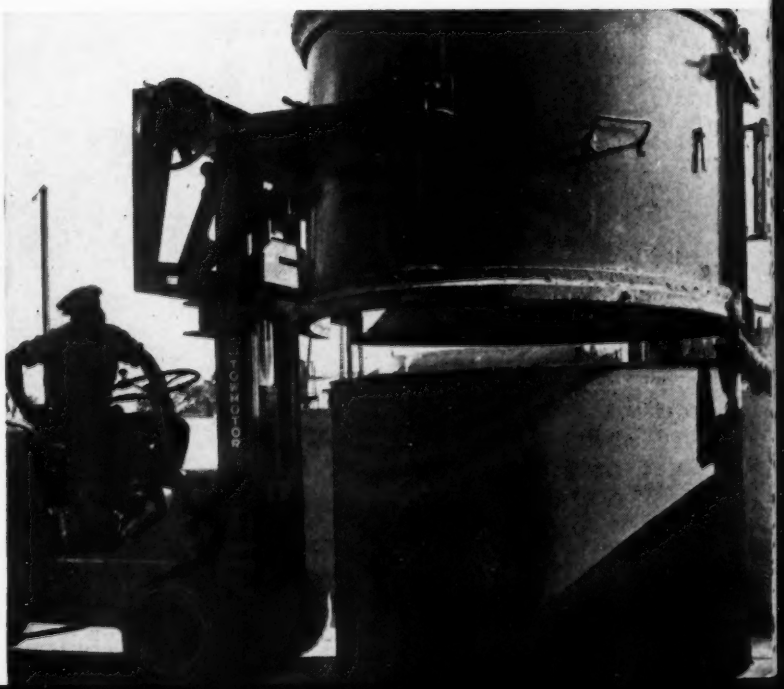
Showing how lift truck has been equipped to handle forms and for stripping large concrete pipe

To the left, top to bottom: Fig. 1: Steel arms on lift truck arranged for lateral adjustment. Fig. 2: Workmen setting the jacket over the reinforcement assembly. Fig. 3: Forms being stripped laterally

To the right, top to bottom: Fig. 4: Showing how forms are lifted vertically. Fig. 5: Showing extensive storage yard. Fig. 6: Lloyd Parker may be seen to the left. Fig. 7: Lift truck with special attachment to raise forms for large pipe above the stripped concrete pipe





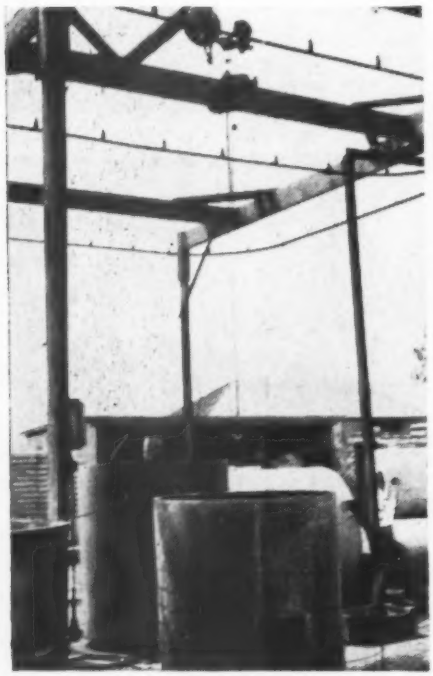


From One Block Machine to Concrete Specialties Field

New emphasis on septic tanks increases sales 100 per cent for West Bend Concrete Products Co.

Frederick Yahr, one of the sons of founder, in lift truck used to load septic tanks

Looking up into interior of one-piece septic tank showing openings



Electric hoist for placing and removing forms

STARTING in 1922 with one Duntile block machine, West Bend Concrete Products Co., West Bend, Wis., has now expanded its production to include concrete tile, pipe and septic tanks, plus small runs of specialties such as lintels, etc., sufficient to keep one Anchor machine busy. Block is now manufactured on a Besser Super Tamper and a Stearns Tamper, of 400 and 240 block per hr. capacities, respectively, and two Dunn drain tile machines are reserved for eight different sizes of tile.

Founded in 1922 by Leonard Yahr, the entire manufacturing, sales and distribution activities have been under the supervision of his sons, Frederick and Allen, in recent years. A son-in-law, John Gerner, also has taken part in activities recently. The company has manufactured septic tanks for 15 years, but only recently has this end of the business been emphasized. Tanks are sold over a greater area than block, and in districts farther than 100 miles from the plant the company maintains dealer connections for sales, installation and service. Purchase of a fleet of semi-trailer units is contemplated for delivery of septic tanks to dealers when sales have increased sufficiently to justify such a move. All deliveries now are handled in a radius of 80 to 100 miles by the company's fleet of six flat-bed trucks: four 2-ton and two 1½-ton.

Septic Tank Sales Increasing

At present, septic tanks represent about 15 per cent of the company's total sales, but it is expected that this will be increased to 20 or 30 per cent in a short time. Market research work has been done to increase sales of this item and the results have been satisfactory. Present sales of other items handled by West Bend Concrete Products are classified as follows: block account for 40 per cent; drain tile represents 20 per cent; and a full line of building supplies equals 25 per cent.

Septic tanks are sold locally to individuals, with company delivery and installation. The company maintains a truck specially fitted for this service with a crane for unloading larger tanks at the job, plus other tools for proper installation.

Tanks, of the company's patented design, are of one-piece construction, including baffles. They are made in

(Continued on page 182)

Pouring platform for the production of concrete septic tanks. To the left may be seen electric vibrator above tank form

Concrete Products Outlook

MANUFACTURERS of concrete products are optimistic regarding 1948 prospects, but express concern regarding cement shortages. Some of the comments follow:

NEW ENGLAND — "We are in the process of building a new block plant which will solve most of our plant operations. We have the elevation so will make use of gravity feed from our bin direct to our mixer to our block machine. Rather than having machinery elevate our material we feel the added expense in the building will offset the cost of machinery and maintenance.

"At present our greatest problem is our machine. We own a hand-operated vibrating machine and in manufacturing gravel concrete block we can produce a good block with a fairly decent top. This summer we added cinder block because of the increased demand, but now we find we are faced with the problem of rough, ragged tops on our cinder block. The company doesn't make a press for the machine so we are now discussing either designing a press or buying a new machine. We are interested to hear what block machine manufacturers have to say as to types of machine to produce both gravel and cinder concrete block.

"We are also interested in finding some way to keep our gravel and cinders from freezing when steam is not available. We do not have a boiler in our plant as our block are air-dryed. In the winter we have our plant heated with hot air. Is there any means of heating the aggregates in the bin?

"Business has gained some over last year but everybody still seems to think prices will go down before they start to build. Commercial building seems to be the largest at present but we feel that home building will expand greatly next year.

"Block are gaining in the building field each day and they are being used more and more around our territory. Farmers are opening up a new market for us in building barns, milk houses, etc., so the picture ahead looks very good."

* * * * *

ALABAMA—"Our business this year has been better than any year since 1929 and our prospects for next year are even better. We are something like two months behind with our work and we have roof tile orders that will keep us busy until next May. Our concrete step business has been very good, and, in fact, all of our concrete products sales have exceeded last year's sales by at least 30 per cent.

"We were fortunate in getting some new equipment such as concrete mixer, air compressor, jack lift truck and new automobiles; therefore, we are looking forward to having exceptionally good business all during 1948.

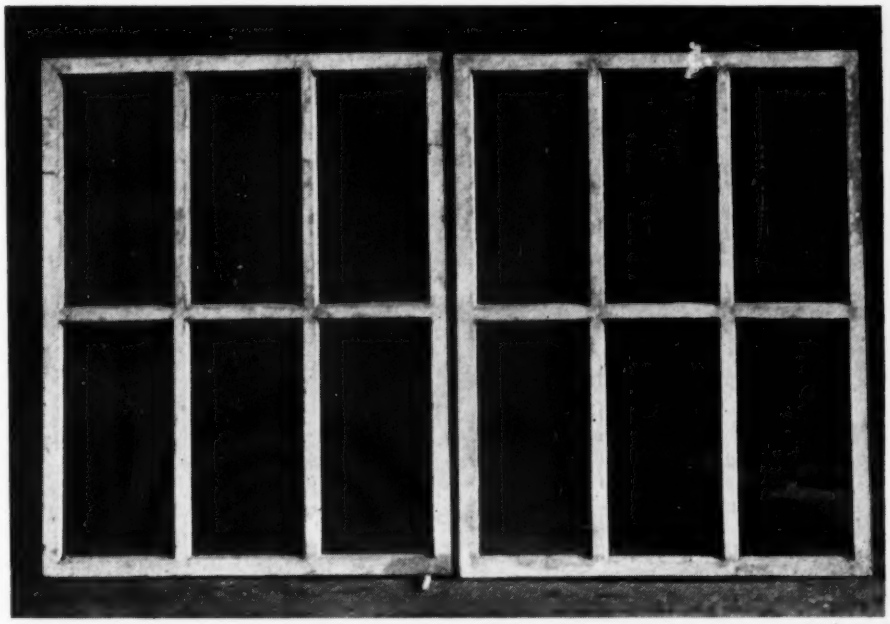
"Our greatest drawback is labor. The government and labor unions have been teaching labor, for the past ten years, that it is not necessary to work to produce wealth but you know there is only one way to produce wealth and that is by labor, and until labor learns to go back to work and do an honest day's work for a day's pay, material will be exceedingly high and will continue to rise."

* * * * *

ILLINOIS—"It seems to me that it becomes more and more apparent that the peoples of the United States are a singularly stubborn and resistant people. Apparently they find it very easy to elude the thought of the old saying that 'We learn by experience.' Time and again, since the founding of our democracy, we have followed the same well-worn path to war, depression and peace in a never-ending cycle, so true to its course, that we can predict within a few years of the place upon the calendar that the various events will take place.

"This is apparent first in the field of industrial relations. Over and again it is the old story about the swinging pendulum and now again, with labor holding the dominating position, we hear over and over the fable of the machine taking the place of the man. How many lessons must labor have before they come to accept the time-proven truth that workers gain as machines usurp? Workers displaced by the installation of labor saving machinery that cuts them from their jobs, are gaining rather than losing. Though they seem reluctant to admit it, time has shown that they are being forced up the ladder into more profitable walks of life. This displacement, one of the foremost problems of the labor unions today, might seem discouraging at a first glance, to one who contemplates entering our industries. The contention is that if factories produce twice as much with half the labor, doesn't it mean fewer jobs? Of course, in the first phase, the factory itself, this is true, but there are other phases to the subject. First, this increase in production has brought around two phenomena. One is the vast expansion of what might be called 'mass servicing.' The other is the equally essential extensive growth of 'mass distribution.'

"For example, the concrete products industry, with the fullest and sincerest use of the newest developments in automatic production, could, were it allowed by the unions, get along with far less labor than the union now allows and produce far greater per man. This would mean lower prices for building materials at a time when a decrease in prices is so desperately needed. This would enable the concrete industry to do its greatest service to the returned veterans who made possible our continued operations by their actions on the field. The labor conditions have caused the concrete manufacturer, in many cases, to neglect his duty to the buying public, and to his industry, by passing on to the consumer, a product not worthy of the industry. If he were allowed to operate as conditions indicate is essential, his production would allow mass distribution on a scale never believed possible. As conditions exist now, for every small community, there is an 'alley' producer, putting out an inferior product that is even now injuring the industry's good name. Now what would this mass distribution mean? As I have indicated, it would force the worker up the ladder, for then, with the removal of the ridiculous building codes, and of the equally unlawful practice of apprenticeships and keeping out newcomers in the bricklayers, masons, and hod-carriers



Precast concrete window sash are one of the interesting building units now being manufactured

unions, and generally, the whole of the building trades unions, the ex-laborers would find themselves to be builders and trained craftsmen in the place of their old jobs, and, too, in a new field of social endeavor. There are far-flung fields that the concrete industry is missing entirely because of the inability to act in the capacity of free enterprise and to engage in mass distribution. In the next five years, thousands of new farm buildings will be constructed, and most desirably, to the farmer, of concrete, but, the high prices necessitated by feather-bedding will again snuff out the industry's chance to take up this challenge at a time when new innovations in the world of science have almost demanded that we build of concrete.

"The old fear has proven false again and again, and, moreover, the workers who remain in the factory to run the new labor-saving machines, command a higher rate of pay; and this results in an improvement in their standard of living. In this day of communistic intrigue and propaganda, it is more than fitting for us to know that the laborer in the United States has more money to spend in restaurants and theaters, for radios, phonographs, automobiles and countless other items. In America, less than 30 per cent of the wage earners' income is spent for food. In Europe, even in prewar years, 60 per cent goes for food and in Asia, prewar, 90 per cent goes for food. Now, however, it is to the great discernment of the populace, almost 90 per cent of Europe's salaries go for food, while in Asia, food is almost the only thing for which earnings are spent. That tells a wonderful story. Contrasted to that is the 'non-food' production margin which is steadily increasing in this country. It means that a great many things now classed as luxuries will soon be considered necessities. The selling and servicing of this great mass of production offers not only jobs for the wage earners who find their old jobs usurped by machines, but obviously offers countless new opportunities to young men looking forward to something more than a mere job. Here are new fields needing new management.

"There is a wonderful future to the story of concrete products. New horizons have appeared in the rebuilding, through the huge profit surpluses that farmers have built up, of all outmoded farm buildings. The large reductions in insurance, as well as the inherent safety features of good concrete, presage a new era of farm building. The lessons that we have just recently learned from the experiences in Maine when the whole of the state was devastated by fires should prove a lesson in the worth of fire-safe construction.

"Though it seems to be borrowing trouble, and, promotion through fear, the progress of construction of the atomic bomb by foreign nations, should again illustrate the necessity for construction with concrete as the experiences in Hiroshima and Nagasaki graphically illustrated that only concrete is able to withstand the onslaughts of the tremendous forces unleashed by chain reaction of atomic disintegration.

"Other innovations in modern warfare . . . the advent of germ warfare . . . also prove the supremacy of concrete construction. All of these things will indicate that with proper cooperation from labor, as well as a well planned public relations campaign, the coming year can be the most prosperous in the history of the industry."

* * * * *

ALABAMA — "The biggest news, as far as we are concerned, and we believe will soon be the biggest news in the industry is the production of the 'Knighton Patented Stone-Faced Block.'

"This new product, a concrete block with a ⅜-in. stone face, which is impervious to moisture, we believe to be the most revolutionary building material since the war.

"As we have a franchise to produce in central Alabama and are ready to begin production, we feel that 1948 will be our biggest year."

WEST VIRGINIA — "Possibilities for 1948 seem very good as there is quite a building boom in this territory, with a much larger one expected for 1948. The anticipated business is one-third industrial building and two-thirds residential.

"One of the chief needs for the industry from my standpoint is an economical way of loading and unloading trucks, emphasis being placed on unloading as labor is very high."

* * * * *

NEW JERSEY—"It has been our experience that when we are confronted with problems (cast stone), the only satisfactory way we can solve them is by building our own machines. This we have done for the last ten years, and have found it much more satisfactory than having an engineer and manufacturer of machinery work on our problems. Secondly, the prospects for business in 1948 look very bright, and we are busier right now than we have ever been in our history.

"The principal handicap which will confront us in 1948 will be our inability to find competent employes who could be developed in our line of work. This was our problem in 1947 and no doubt will be even worse in 1948. We usually have to employ and try ten different men before we find one who is acceptable."

* * * * *

NEW YORK — "Our most serious problem this year has been in the yard handling of our block from the kilns and the loading of trucks. This is not a new problem, but still an unsolved one. The method of handling today by using fork lift trucks and cubing has been a great help toward this solution. We have found that this method, although a great improvement, has other factors connected with it which are undesirable. The advantages far exceed the disadvantages and this has been the method used in our plant up to the first of November.

"We have tried to look at this picture from a heavy material handling problem. Most industries having such a bulky, heavy material to handle, eventually have come to use a bridge crane. As a result of such observation we decided about nine months ago to build a large covered shed and install parallel runways for two 5-ton bridge cranes, each having a 40-ft. span. The last of the necessary equipment was received late in October, 1947. All controls on the crane are operated by the man handling the large suspended fork from the ground and consist of a simple push-button panel allowing a range of three speeds in each direction.

"Our block are 18 in. long, therefore our cubing problem is a little more difficult than for the 16 in. type. For our fork trucks, the cube consists of 87 8-in. block. With the bridge crane, the cube has been increased in size to 204 8-in. block. This large cube is 90 in. by 54 in. on the base and 48 in. high. The block of these cubes can be piled and tied in as we used to load by hand, namely five block end to end for the full width of the truck. Since the cube is suspended by cable, it can be placed easily on the truck in its proper position. This is a great advantage over the fork lift truck method which requires loading from each side. Only five cubes or trips are required by bridge crane to load a tractor trailer while 12 trips are required by lift truck to make the same load. The upkeep of such a crane is very small and the cost of operating three electric motors in the low rate bracket is much cheaper than operating gasoline motors. There are many other advantages with this type of operation and probably more will be discovered the longer the system is used.

"There are many other problems confronting us but at the present time they are not of enough importance to discuss in this letter. The shortage of cement and bulk cement cars has given us many bad moments this Fall. This situation looks to us to be one of the big problems in our industry, if 1948 is a boom year which in our area we have every reason to expect."

* * * * *

WASHINGTON — "It is my thought that one of the hardest problems in the manufacture of concrete pipe by either tamped or packerhead processes is the grading of the material used. Almost all manufacturers use commercial grading in spite of the fact that the grading of commercial materials is worked out for a satisfactory use in combination with 1½-in. gravel in plastic concrete.

"In any area it is necessary to use the material at hand. A great many plants use paving sand which contains a varying quantity of ¼-in.

rock. When this material is combined with small pea gravel obviously the quantity of so-called rock varies with each batch. It would seem that some method of controlling the particle size of the material is a requirement for the manufacturer of concrete pipe of a uniformly good quality.

"In most areas, materials graded to the following sizes would greatly increase production of uniformly good pipe: sand minus ⅛-in.; granulitic minus ⅜-in. to plus ⅛-in.; pea gravel minus ¾-in. to plus ⅜-in. Most of our pipe manufacturers who operate their own sand and gravel plants also furnish materials of a commercial grading.

"Prospects for business in 1948 look very good at this time. We have no authentic information how the volume will be proportioned as to public works and private building. Prospects for both look good at this time."

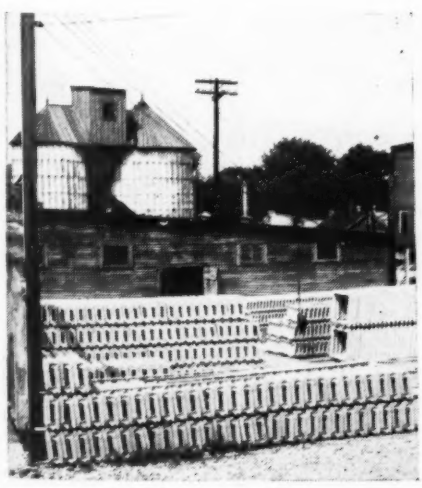
Silo Staves

(Continued from page 161)

height up to 60-ft. Chutes, receiving rooms and doorways are also formed of reinforced concrete and designed to fit the silo.

While the plant is operated on a year-round basis, the silo erection crews are able to work only during the summer and early fall. Staves scheduled for spring or summer erection are delivered to farms throughout the winter months, a system which keeps company property from becoming too crowded with stave stockpiles. The company maintains its own erection crew, trucks and scaffolds; and also has two or three additional crews under contract during the peak erection season. The silo is pointed up on the inside at all stave joints while being erected, and the outside is covered with a coat of cement grout.

Mason & Lawrence put out a small illustrated brochure that gives dimensions and details of construction, plus pertinent information for the farmer's information on silo use and economy.



In the background are two concrete stave silos which hold sand and gravel aggregates. In the foreground are stockpiles of concrete staves and window frames

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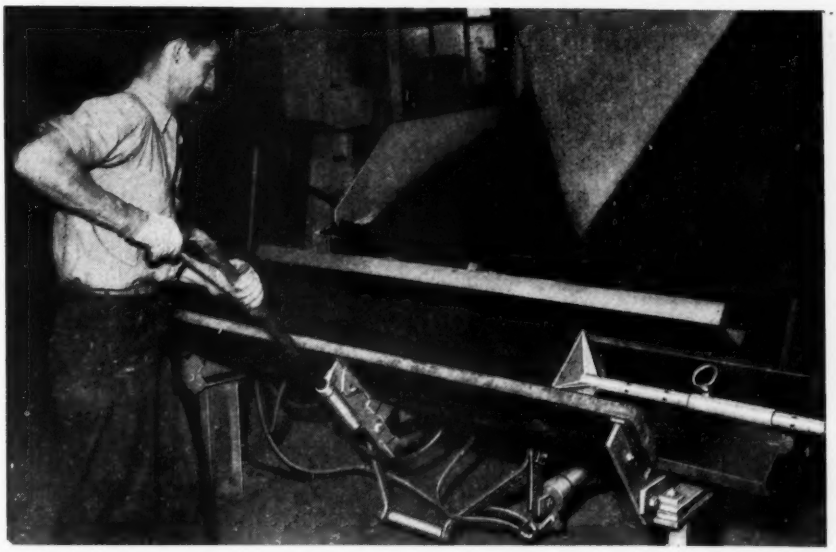
with the new KENT LINTELator



Give your business a boost by supplying an additional badly needed product.

Produce high grade, reinforced concrete lintels up to six feet long from any aggregate, at high speed and low cost.

Sell them on almost every order for blocks at prices that assure a nice profit.

You can do just that with this New Kent Lintel Machine, which is thoroughly proved and definitely successful.

Despite the existence of a great market nothing like this practical and profitable machine has ever been available before.

Expand your sales and profits. Be first in your field to supply this needed item. Use it as a lever to interest new customers you have never been able to sell.

Check, sign, tear off and mail the coupon below for complete information.

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California Concrete Pipe Meeting

HIGHLIGHTED by the address of FRED C. SCOBEY, Senior Irrigation Engineer of the U. S. Department of Agriculture, plus a forum of cement chemists and a report on recent load tests of reinforced concrete pipe, the Fall Meeting of the California Associated Concrete Pipe Manufacturers held at the Hotel El Tejon, Bakersfield, Calif., October 23-25, drew the largest attendance in the history of the association since its organization in 1919. Representatives included concrete pipe manufacturers from approximately 65 plants in seven Western states, industry supply representatives and special guests.

Regular session opened Thursday afternoon, October 23, following a meeting of the board of directors, at which time ENGINEER H. A. WEIGAND of the association reported that he had visited 57 member plants since April and emphasized the need for regular inspection and tests by all manufacturers, proper gradation of aggregates and mixes, adequate curing, and a follow-up by all producers to see that pipe is properly used and installed.

HOWARD F. PECKWORTH, managing director of the American Concrete Pipe Association, reported on the activities of the national organization, announcing that the next convention will be held in New Orleans following the Mardi Gras. A report prepared by the Coast Laboratories of Fresno relative to the use of concrete pipe for conveying winery wastes was read and discussed.

As one of the highlights of the meeting, the report was made on the load tests of reinforced concrete pipe conducted by the Concrete Products Association of Washington at the University of Washington on the huge testing machine built by the Baldwin Locomotive Works and installed at a cost of $150,000. Five sections each of 36-in., 60-in. and 72-in. reinforced pipe 4-ft. long were tested by the three-edge and five by the sand bearing method to determine the relationship between the two methods. The Baldwin machine stands 37 ft. high with a 40-ton base beneath the concrete floor, a span of 10 ft. between vertical screws, and a capacity of 2,400,000 lbs. in tension and compression.

RAY C. SPARLING, Sparling Meter Co., Los Angeles; HARRY RIDDELL, Engineer Co., San Joaquin Municipal Utility District, Delano; E. C. FORTIER, engineer, Bureau of Reclamation, Friant, and R. B. Cozzens, District manager, Bureau of Reclamation, Fresno, gave brief talks at the Friday session, after which the principal speaker, Mr. Scobey, discussed "Hydraulics and Concrete Pipe."

Participating in the forum of chemists of California cement manufacturers were W. R. KLECKNER, Pacific Portland Cement Co., San Francisco; R. M. WILLSON, Southwestern Portland Cement Co., Los Angeles; E. A. LEDYARD, Monolith Portland Cement Co., Los Angeles; T. F. MULLAN, Permanente Cement Co., Oakland, and ORVILLE JACK, Permanente Cement Co., San Jose, who each spoke separately and then answered questions from the floor on curing, air entraining agents, admixtures, aggregates and other related subjects.

It was agreed that the fundamentals of good concrete are proper gradation and mixing of good aggregates plus adequate and timely curing. The meeting came to a close Friday evening with a dinner dance and the announcement that the next meeting, to be an annual affair, will be conducted in Fresno, Calif., April, 1948, at which time there will be an election of officers and directors.

Masonry Price Increase

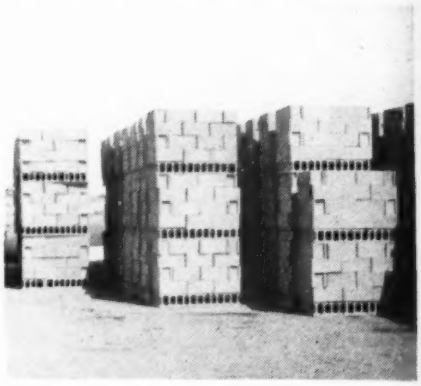
THE CONCRETE MASONRY MANUFACTURERS, Mansfield, Ohio, a newly formed organization of twelve area firms, has found it necessary to increase the price of products sold by ten per cent. Herman J. Schmitz, general manager of the Cement Products Co., Mansfield, and chairman of the manufacturer's group, said the price hike was necessary in order to offset increased freight rates as well as increased costs of equipment and raw materials.

Promoting Sale of Dry-Mix Concrete

HARRY T. CAMPBELL SONS' CORPORATION, Towson, Md., manufacturer of Sakrete, a dry-mixed concrete, believes in taking every available opportunity to promote the sale of this product. In the illustration may be seen a large semi-trailer-tractor unit pulling away from the plant with a load of 1000 sacks. Each side of the trailer body has been very attractively painted with a message indicating the name of the product and how it is used. Daily deliveries are made throughout Maryland, Virginia, West Virginia, Pennsylvania, Delaware, and New Jersey.

Storing Cubed Block

A NEAT and orderly looking yard results from the system used to store cubed block at the plant of Atlas Lime Co., El Paso, Texas; but more than



Block storage yard showing cubes piled three high

neatness, ease of storing or truck loading is gained from this functional cubing system. The block are removed from the curing kilns and cubed (75 8- x 8- x 16-in. block per cube), preparatory to being moved to the storage yard by lift truck, where the cubes are piled three high. By leaving a space between the rows of cubes, the same lift truck can readily remove a cube of block from the row and place it on a truck for customer delivery.

Saw Clamp

THE CLIPPER MANUFACTURING CO., Kansas City, Mo., has designed an adjustable conveyor cart for its masonry saw. Known as the "Instant Clamp," this accessory makes possible cutting of concrete block or brick into intricate shapes and sizes. It is designed to handle any thickness of masonry material up to 5 in., or a width of 12 in. Two styles are available: No. 45, for models "H" and "J" Clipper masonry saws, which elevates 45 deg., and No. 90 for models "B," "C" and "E" saws—a non-elevating design for angles, as well as straight cutting.

Truck load of Sakrete leaving Sakrete plant of Harry T. Campbell Sons' Corporation. In the picture may be seen Robert F. Porter, manager of the plant, and J. Walbach Edelen, president; John W. Edelen, secretary; and James W. Cox, vice-president, all of Stebbins-Anderson Co.

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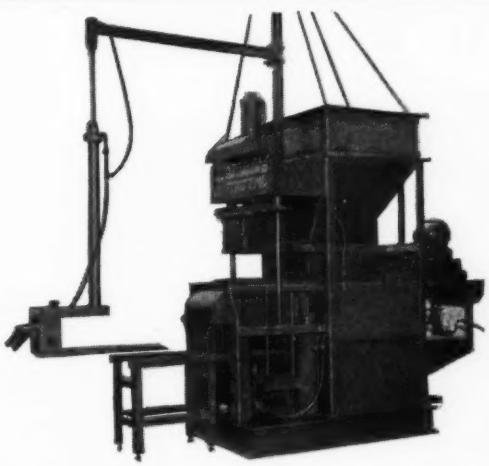

Syntro-Pac Fully Automatic Plain Pallet Stripper

Rated capacity 4000, 8"x8"x16" blocks per day. TWO-8" block are produced at a time; THREE-6" block; FOUR-4" block; ONE-12" and ONE-4" block; chimney block; other sizes and all Specials, all made on one pallet size. ONE man operation, complete change over *in less than ten minutes*. Furnished complete with Air Offbearer. Write or wire for complete details.

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Sold thru BLOCK MAKERS only!

For Exterior or Interior use on Cinder Blocks, Light-weight Aggregate and Concrete Blocks.

AGRASEAL penetrates deep, seals pores, withstands alkali, water, steam, sun, smoke, heat, cold, frost, ice, dampness, etc. • Halts capillary action. • Easily applied with scrub brush. • Comes in powder form—mixes with water. • 6 Colors: White, Ivory Cream, Light Buff, Natural Stone Grey, Sunny Yellow, Light Green. • Packed in 100 lb. steel drums. • Block manufacturers order now!

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HARD FACING with COLMONOY PLASTIC BONDED ROD

Tomorrow's Method with Today's Equipment

Use your regular metallizing gun. As the rod goes through the flame the plastic burns away and the fine particles of Colmonoy deposited form a hard-facing that gives much longer wear. Colmonoy is more corrosion resistant than stainless steel. It outwears hardened steels from 3 to 40 times. There are many applications in the rock products industry where the Colmonoy Sprayweld Process, combining metallizing and welding procedures, is the best and most economical method of hard-facing dipper teeth, guides, cams, sleeves, and hundreds of other parts.

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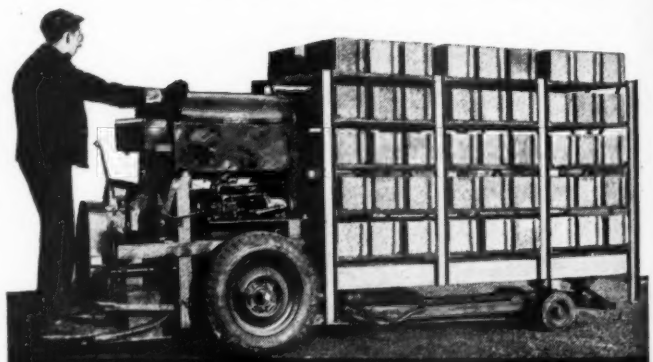

HANDLES EASILY with an *Erickson*

When you handle a rack of 90 8x8x16 blocks over ordinary unpaved runways—it's actually costing you money to operate without an Erickson Power Lift Truck. The platform on the truck illustrated above slides under rack from end—enables you to place racks close together in kiln. Find out what an Erickson Platform or Fork Truck can do to cut your costs and increase output.

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Concrete Steps

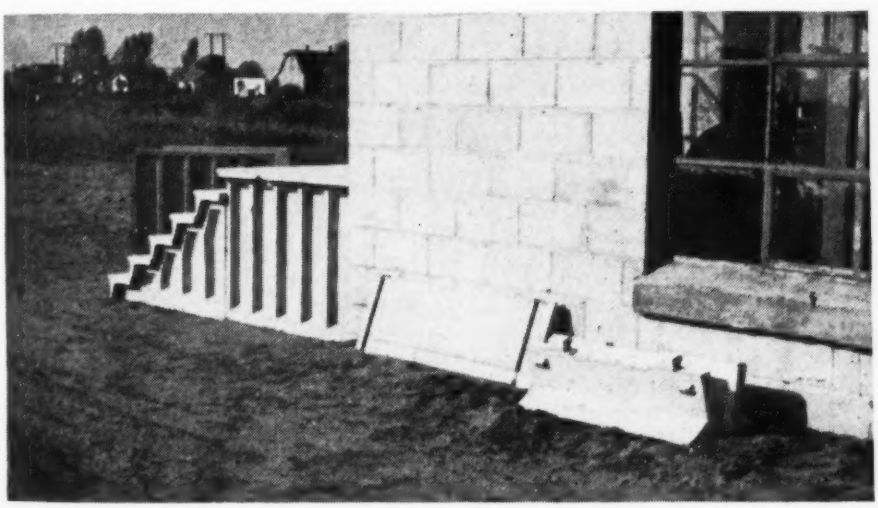
E. A. ROGGE & SONS, Marinette, Wis., recently built a new plant on a 3½-acre site in this city to manufacture sets of metal molds for the company's patented concrete steps and also to make the finished concrete steps. The old plant will continue in use for the manufacture of concrete block. Concrete products manufacturers in Springfield, Mo.; Pasco, Wash.; Nashua, Iowa; Spokane, Wash.; and Charles City, La.; are now using the step molds made by this concern.

The business was founded by E. A. Rogge in 1924 in Marinette, Wis., under the name of Cast Stone Block Co. Concrete block were the only product until 1937 when Mr. Rogge started experimenting with precast concrete steps and porches. He developed an interlocking device that makes the steps entirely safe to assemble on the job. In 1943, the interlocked precast steps were patented, and it was found that the steps could be delivered and set up as cheaply as wood and cheaper than pouring on the job. Mr. Rogge continued to experiment with wooden forms until the present metal forms were developed. The concrete step business today has grown to a volume exceeding concrete block.

Metal forms for steps are sold in sets comprising 3-, 4-, 5-, and 6-ft. lengths. The sidewall forms for the steps are in the following pair combinations: two-step, three-step, four-step, five-step, and six-step sizes.

A mix of three parts of sharp washed sand, two parts of ½-in. gravel and one part of cement. A stiff workable mix is employed. Total volume of material used in one run of all the forms mentioned above is 1⅓-cu. yd. The 3- and 4-ft. steps are reinforced with two ¼-in. rods; the 2-, 3-, and 4-ft. sidewalls are reinforced with ¼-in. reinforcing rods. All other steps and sidewall are reinforced with ⅜-in. rods. Rods are wired to 2- x 2-in. 14-gauge wire mesh which covers the entire area of the forms, but any 2-in. mesh can be used. The steps have a 6-in. rise and a 11-in. tread. The finished step and sidewalls are 2-in. and 2½-in. thick, respectively. Each set of steps beyond four steps could have a set of hand rails, and the steps are provided with rail hole lugs for this purpose.

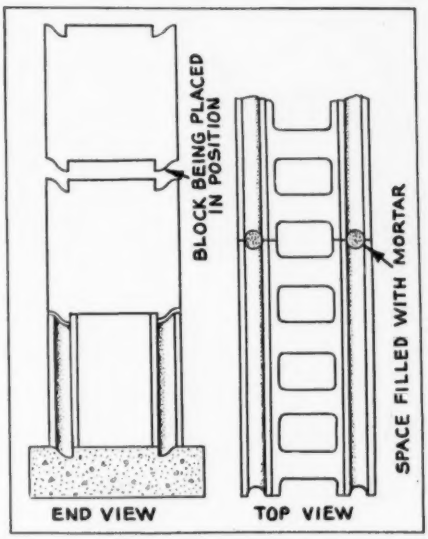
Porch forms consist of a reversible sidewall form and two slab forms. The sidewall form is adjustable for heights from 24-in. to 42-in. Floor slabs are provided with tongue-and-grooves, and the forms are adjustable for depth up to 4 ft., and for width from 3 to 6 ft.



Above: Samples of the precast interlocking concrete steps and sidewalls. Below: Some of the metal forms used in casting steps and sidewalls

Self-Aligning Block

GEORGE C. KIRCHNER & SON, Collinsville, Ill., has announced a new self-aligning building block, which through special grooves and tennons, will form



Details of self-aligning block

a wall that is straight and plumb with a minimum of skill on the part of the builder.

No adjustment of mortar joints is required, it is claimed, as both horizontal and vertical joints are determined by the block itself, and the block automatically assume correct position in relation to other units in the wall.

In addition the block leave a space between the ends of the outer and inner webs which can be filled from above with mortar after a course has been laid on the wall. Corner blocks, fractional blocks, curved blocks, joint blocks, gable blocks and angle blocks all can be made on this same principle.

New Type Hollow Block Forms Complete Wall

THE INVENTION of a new type hollow block, so designed that the exterior wall of a building can be built with it employing only the masonry trade and only one block in the thickness of the wall, has been announced by Morris Lapidus, Brooklyn, N. Y.

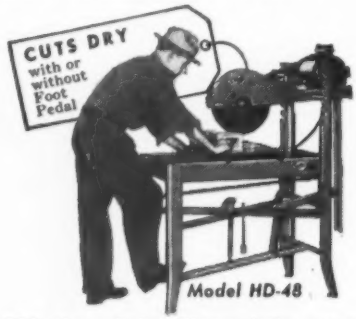
The block comprises two relatively spaced opposed shells, one of suitable material and color for the exterior wall and one suitable for the interior, joined by rods. These may pass through insulation board placed adjacent the inside face of each shell or fixed between the inside faces of the shells, which are then filled with concrete, or may be kept free from rust through the use of insulating material in the space between the shells.

Other advantages claimed in the use of the block for walls are that a complete exterior wall of a building can be built at less expense and in less time, and yet will be lighter in weight, insulated against the weather.

FASTER CUTTING

WET or DRY with the NEW HD 48 CLIPPER Masonry Saw

You'll be amazed how quickly and easily you can cut virtually any special length or shape from the hardest masonry materials. Clippers save time — save material, assure better workmanship on every job.



With the exclusive Clipper design, proven throughout the world and guaranteed to provide the fastest cutting speed and the lowest cutting costs.

DUSTLESS MASONRY CUTTING so fast and easy. Just turn on the circulating water system and slice through the hardest masonry materials. Foot Pedal control for varying material sizes or lock the cutting head at a set position, whichever is desired.

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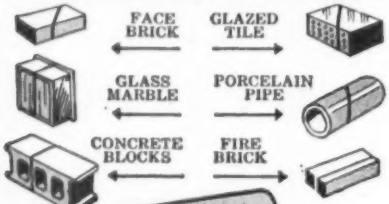

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Merchandising

(Continued from page 174)

five different sizes and six styles, ranging from 260- to 600-gal. capacity, and are completely reinforced with 4- x 4-in. 10-gauge wire mesh. Walls are 2-in. thick and tops are 4-in., with the bottoms being poured at the installation site when required.

Sacked cement is used at the present time for all plant mixes, but bulk cement and overhead bins for storage are being considered. Aggregate is stored in a 3-compartment overhead bin, each compartment holding 30-cu. yd. Both the bin and weigh-batcher system were supplied by Butler. Air-entrained portland cement is used for all concrete products. Torpedo sand, minus ⅜-in., is delivered by truck, a haul of three miles. When the natural sand contains insufficient fines, minus 6-mesh limestone is added for greater plasticity. Good density is reportedly obtained by use of a Jackson electric vibrator attached to the center shaft of the inner form or core when manufacturing tanks and concrete pipe. Additional vibration, as supplied by strap vibrators on the outside of the form, is being considered in order to shorten the vibration period.

Plans call for a new building, complete with overhead bins and mixer, to house the septic tank operation. The new structure will include kilns for curing septic tanks, which will cut in half the present 21 days curing time. Tanks are stockpiled in the yard or loaded for truck delivery by a gasoline engine-powered Scoopmobile fork truck. Two forks are used for handling tanks or large pipe, and two extra forks are attached when block or tile is being cubed or loaded. In addition, a gasoline engine-powered Yardman, and an electric Automatic Transport plus a hand lift truck are used in the plant and yard.

Block and concrete tile at this plant are steam cured in kilns of concrete block construction—some of the earliest kiln construction still being used was built with round-core block made in the 1920's on Duntile machines. Of the five kilns, three are used for block and two for tile, with each having a capacity of 3000 units of either block or tile. A 6-in. cinder fill is used on top for insulation. Both types of unit follow the same curing cycle: 6- to 8-hr. live steam, 6- to 8-hr. dry heat. Three mixers are used in the plant, one 35-cu. ft. and two 14-cu. ft. capacity; all of Desplaines Concrete Products Co. design.

Caught in Sand Hopper

JOSEPH MARAMONTE, operator of the Maramonte Cement Block Co., Milwaukee, Wis., had a narrow escape when he was caught in the sand hopper at his plant. He had gone into the top of the 28-ft. hopper to loosen clogged sand when it suddenly gave way and swept him to a narrow point half way down the chute. He directed his rescue by firemen called by his son, Mike, who heard his cries for help. Five minutes after his release from the chute Mr. Maramonte was discussing business with a customer, none the worse for his experience.

New Orleans Convention

(Continued from page 169)

archway leading into the patio; and Geo. Katterjohn was kept busy introducing Pat O'Brien to as many as possible.

The social program was well planned and showed much thought: official lunches and dinners were held at almost every famous eating place in New Orleans, with the menus chosen to show the Crescent city's epicurean treats at their best. Both walking and bus tours were held to acquaint those who had never been to New Orleans before with the city. When the business meetings began on Monday, activities were provided for the ladies that took them to still more cafes, on more sightseeing tours, and made the visit anything but dull for the fairer sex.

Highlight of Saturday's activities was the two-hour trip aboard the New Orleans Board of Port Commissioners' Diesel yacht, *Good Neighbor*. About 80 took the trip, enjoying the sights of the busy harbor, small cups of black coffee and cokes. A running commentary was provided by Lynn Covert of the commission, pointing out everything worthwhile as it came in view.

Both from the standpoint of work accomplished as well as entertainment and opportunity afforded for man-to-man discussion of block plant problems, the New Orleans convention was a complete success.

Improved Water-Proofing Agent

RANETITE MANUFACTURING CO., St. Louis, Mo., has announced that its product, Ranetite No. V Transparent Water-proofing agent, has been improved. According to the manufacturer, the improvement consists of incorporating calcium and aluminum stearates together with chlorinated paraffin, a soluble material comprising 60 per cent paraffin and 40 per cent chloride. Carbon tetrachloride also has been added, serving as a fire-proofing agent.

Named Co-Chairman

FREDERICK W. REINHOLD, president, Anchor Concrete Products, Inc., Buffalo, N. Y., has been named co-chairman of the industrial division of the Erie County Chapter of the American Cancer Society. Mr. Reinhold will conduct a cancer education program in local industries.

•

LOUIS E. WETTLAUFER, former president of the Niagara Concrete Mixer Co., Buffalo, N. Y., died recently at his home at Windmill Point, Ont., after an extended illness.

The machine with electric ears

A typical example of B. F. Goodrich product development

ONCE in a long while, when tops are soldered onto evaporated milk cans, a drop of solder falls into the can and is sealed in. And once-in-a-while is too often for good canners.

So one of them developed this machine. It has a pair of moving rubber belts which seize each can between them. At one point the moving belts are jerked upward, shaking the can. If there is the smallest piece of solder inside, it "pings." An electric ear hears that ping, works an arm, and the offending can is thrown out.

But it was murder for rubber belts. They have to have enough "give" to stretch for the shaking action yet still hold the can snugly enough to move it along the line. And during the shake the belts must scuff over the can without wearing or tearing.

B. F. Goodrich had developed a belt made of strong cords each encased in thick rubber, so the cords can "give" yet quickly return to position. In addition, B. F. Goodrich had developed a means of making a belt endless, with no metal fasteners to catch or cut.

These B. F. Goodrich belts were tried on the machine and worked perfectly — they last longer, don't stretch out of shape, work more smoothly than other belts tried before.

Developments in rubber are taking place constantly at B. F. Goodrich. That's why it pays to check with your B. F. Goodrich distributor, to see what improvements BFG has made recently in the products you use. *The B. F. Goodrich Co., Industrial Products Division, Akron, Ohio.*

B.F. Goodrich

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